CRM 86-168 / June 1986

# ESTIMATING THE COST OF ATTRITION OF FIRST-TERM ENLISTEES IN THE MARINE CORPS

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Work conducted under contract N00014-83-C-0725.

# REPORT DOCUMENTATION PAGE

| | |
|---|---|
| 1a. REPORT SECURITY CLASSIFICATION<br>UNCLASSIFIED | 1b. RESTRICTIVE MARKINGS |
| 2a. SECURITY CLASSIFICATION AUTHORITY | 3. DISTRIBUTION / AVAILABILITY OF REPORT<br>Approved for Public Release. Distribution Unlimited. |
| 2b. DECLASSIFICATION / DOWNGRADING SCHEDULE | |
| 4. PERFORMING ORGANIZATION REPORT NUMBER(S)<br>CRM 86-168 | 5. MONITORING ORGANIZATION REPORT NUMBER(S) |
| 6a. NAME OF PERFORMING ORGANIZATION<br>Center for Naval Analyses<br>6b. OFFICE SYMBOL (*If applicable*)<br>CNA | 7a. NAME OF MONITORING ORGANIZATION<br>Commandant of the Marine Corps (Code RDS) |
| 6c. ADDRESS (*City, State, and ZIP Code*)<br>4401 Ford Avenue<br>Alexandria, Virginia 22302-0268 | 7b. ADDRESS (*City, State, and ZIP Code*)<br>Headquarters, Marine Corps<br>Washington, D.C. 20380 |
| 8a. NAME OF FUNDING / ORGANIZATION<br>Office of Naval Research<br>8b. OFFICE SYMBOL (*If applicable*)<br>ONR | 9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER<br>N00014-83-C-0725 |
| 8c. ADDRESS (*City, State, and ZIP Code*)<br>800 North Quincy Street<br>Arlington, Virginia 22217 | 10. SOURCE OF FUNDING NUMBERS<br>PROGRAM ELEMENT NO. 65153M; PROJECT NO. C0031; TASK NO.; WORK UNIT ACCESSION NO. |

11. TITLE (*Include Security Classification*)
Estimating the Cost of Attrition of First-Term Enlistees in the Marine Corps

12. PERSONAL AUTHOR(S)
Laurie J. May, Jacquelyn Hughes

| 13a. TYPE OF REPORT | 13b. TIME COVERED | 14. DATE OF REPORT (*Year, Month, Day*) | 15. PAGE COUNT |
|---|---|---|---|
| Final | FROM TO | June 1986 | 66 |

16. SUPPLEMENTARY NOTATION

| 17. COSATI CODES | | | 18. SUBJECT TERMS (*Continue on reverse if necessary and identify by block number*) |
|---|---|---|---|
| FIELD | GROUP | SUB-GROUP | |
| | | | |
| | | | |
| | | | |

19. ABSTRACT (*Continue on reverse if necessary and identify by block number*)

This research memorandum estimates the cost that the Marine Corps incurs when first-term enlisted personnel leave the service. The expected cost of attrition is calculated for several personnel categories that are defined according to levels of education and ability.

| 20. DISTRIBUTION / AVAILABILITY OF ABSTRACT | 21. ABSTRACT SECURITY CLASSIFICATION | |
|---|---|---|
| ☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS | Unclassified | |
| 22a. NAME OF RESPONSIBLE INDIVIDUAL<br>Lt.Col. G. W. Russell | 22b. TELEPHONE (*Include Area Code*)<br>(202) 694-3491 | 22c OFFICE SYMBOL<br>RDS-40 |

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20 October 1986

MEMORANDUM FOR DISTRIBUTION LIST

Subj: Center for Naval Analyses Research Memorandum 86-168

Encl: (1) CNA Research Memorandum 86-168, "Estimating the Cost of Attrition of First-Term Enlistees in the Marine Corps," by Laurie J. May and Jacquelyn Hughes, Jun 1986

1. Enclosure (1) is forwarded as a matter of possible interest.

2. This Research Memorandum estimates the rate and cost of first-term attrition for several personnel categories defined by different education and ability levels.

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CRM 86-168 / June 1986

# ESTIMATING THE COST OF ATTRITION OF FIRST-TERM ENLISTEES IN THE MARINE CORPS

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## ABSTRACT

This research memorandum estimates the cost that the Marine Corps incurs when first-term enlisted personnel leave the service. The expected cost of attrition is calculated for several personnel categories that are defined according to levels of education and ability.

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# EXECUTIVE SUMMARY

This research memorandum calculates how much attrition costs the Marine Corps by examining attrition rates and replacement costs among several personnel categories. The rate of attrition from the Marine Corps is an important factor in making a cost-effective selection of enlisted personnel. Estimation of the current attrition rates and the associated costs helps the Marine Corps make a cost-effective selection of personnel.

An attrition rate is calculated for each of the major phases of first-term enlistment, i.e., the delayed-entry program (DEP), boot camp, initial-skill training, and the remainder of the first term. In addition, attrition rates are calculated for several personnel categories, which are defined by level of education (high school graduate or nongraduate) and ability (gauged by the Armed Forces Qualification Test (AFQT)). The attrition rates are calculated by tracing the careers of individuals who entered the Marine Corps in the early 1980s. Attrition rates differ dramatically when compared across the educational levels, but only slightly when compared across the ability categories (table I).

TABLE I

EXPECTED ATTRITION PER 100 CONTRACTS[a]

| Category | Enlistment phase | | | | |
|---|---|---|---|---|---|
| | DEP | Boot camp | Initial-skill training | After training | Total |
| All | 11.1 | 10.8 | 1.7 | 18.8 | 42.4 |
| HSG | 11.0 | 9.9 | 1.5 | 15.9 | 38.3 |
| NHSG[b] | 12.2 | 24.7 | 2.3 | 25.0 | 64.2 |
| AFQT I, II, IIIa | 10.5 | 10.4 | 1.5 | 17.7 | 40.1 |
| AFQT IIIb, IV | 11.5 | 11.4 | 2.0 | 19.7 | 44.6 |
| HSG; NHSG AFQT I, II, IIIa | 10.5 | 8.8 | 1.6 | 18.2 | 39.1 |
| NHSG AFQT IIIb | 16.5 | 15.1 | 2.5 | 28.5 | 62.6 |

a. Attrition per contract will differ from the more commonly quoted figures on attrition per accession. These rates were calculated from various HQMC files for research purposes only. Headquarters, Marine Corps should be contacted for official rate information.

b. High school nongraduates, including individuals who have a Certificate of High School Equivalency.

The cost of attrition equals the cost of replacing the individuals who leave times the probability that the individuals will leave. The recruiting effort expended to replace an individual who leaves is determined using 1978 cross-sectional data. Recruiting effort, in terms of time, is translated into a dollar measure using the 1985 cost data. Replacement training costs are determined from 1985 data. The cost of attrition varies across personnel categories because both attrition levels and replacement costs vary. The results are summarized in table II; attrition cost is reported as the expected attrition cost per contract (i.e., the cost of replacing individuals who leave is prorated over all contracts in the same quality category).

TABLE II

THE EXPECTED TOTAL COST[a] OF FIRST-TERM ATTRITION BY PERSONNEL CATEGORY
(FY 1985 dollars per contract)

| | | Number of contracts | | |
|---|---|---|---|---|
| Quality | Definition | 10,000 | 20,000 | 40,000 |
| High | HSG[b] | $2,200 | $2,400 | $2,800 |
| Low | NHSG[c] | 3,200 | 3,200 | 3,200 |
| High | AFQT I, II, IIIa | 2,500 | 3,700 | 6,900 |
| Low | AFQT IIIb, IV | 2,200 | 2,200 | 2,200 |
| High | HSG<br>NHSG AFQT I, II, IIIa | 2,200 | 2,400 | 2,600 |
| Low | NHSG AFQT IIIb | 3,100 | 3,100 | 3,100 |

a. Rate of attrition times cost of replacement.
b. High school graduates.
c. High school nongraduates, including individuals who have a Certificate of High School Equivalency.

Categorizing personnel by education reveals that the expected cost of attrition per contract is highest for nongraduates. Categorizing personnel by ability level reveals that the expected cost of attrition is highest for high-ability individuals. The attrition cost per nongraduate contract is high

because nongraduates leave the service at a high rate. The cost of attrition is high for high-ability individuals because bright people are expensive to recruit and thus costly to replace.

In contrast, when the personnel categories are defined by both education and ability, the expected cost of attrition is higher for low-ability nongraduates. The attrition rate for low-ability nongraduates is basically determined by education level because attrition does not vary significantly across ability levels. The high attrition rate of low-ability nongraduates results in a high expected attrition cost for this group.

Although attrition costs favor the recruitment of high school graduates and low-ability individuals, the minimization of attrition costs cannot be used as the sole criterion for cost-effective personnel selection. Other factors, such as performance levels, recruiting costs, and training costs of candidates who do not leave must also be considered.

# TABLE OF CONTENTS

## LIST OF ILLUSTRATIONS

## LIST OF TABLES

## INTRODUCTION

Attrition is costly to the Marine Corps, especially when personnel leave the service in their first term of enlistment. Review of the current attrition pattern and its associated costs helps the Marine Corps make cost-effective decisions when selecting personnel. In addition, knowing the cost of attrition aids in determining the optimal contract length and reenlistment rate. The cost incurred when an individual leaves the service depends on the enlistment phase. In addition, the probability an individual will leave the service varies with mental ability and education. Thus, the expected attrition cost associated with a group of accessions depends on the attrition pattern and the ability and educational levels of the personnel.

## THE COST OF ATTRITION

The cost of attrition equals all the expenses of replacing an individual minus any investment recouping that may be made by depressing the wages of new personnel. Under the assumption that the Marine Corps recoups at least part of its investment in recruiting and training by keeping initial wages low, the cost of attrition varies over the enlistment period. Under this scenario, the cost of attrition rises during the training period and then declines after the Marine is assigned a job.

Measuring the cost of attrition that occurs prior to completion of the training period is relatively straightforward and involves summing up all the expenditures the Marine Corps incurs to replace the individual who leaves. When an individual leaves the delayed-entry program (DEP), the cost of attrition equals the cost of recruiting a replacement. In contrast, when an individual leaves during the training period, the cost of attrition equals the cost of recruiting a replacement plus training that replacement to the level of training reached by the departing individual. In other words, the cost of training-period attrition is not only more expensive to the Marine Corps than DEP attrition, but the cost also rises according to an individual's level of training.

Measuring the cost of attrition after the completion of initial training is more difficult than in other phases because one must account for any investment recouping that may occur. Because the Marine Corps produces a service that is not sold in a market, it is difficult to value the production of an individual Marine in an economically meaningful way. Without knowing the value of a Marine's output, it is extremely difficult to measure accurately the

degree of investment recouping and thus the cost of post-training attrition. Therefore, this analysis makes strong assumptions about the wage structure in the Marine Corps to quantify the cost of post-training attrition.

## THE GENERAL PATTERN OF ATTRITION

Attrition is most frequent during the initial phases of the enlistment period. Figure 1 gives the attrition rates by enlistment phase for male non-prior-service regulars (nonreservists). Figure 1 is compiled from 1984 DEP and boot-camp attrition data and 1980 data on attrition after boot camp. As shown in figure 1, attrition from the DEP is relatively high and remains high during boot camp, the first phase of the training process. Once individuals complete boot camp and enter initial-skill training, the attrition rate falls significantly. However, in the period between the completion of initial-skill training and 6 months before contract termination, total attrition is high.

A slightly different pattern emerges when one looks at the attrition rate in increments of 120 days. Figure 2 shows the separation level by 120-day periods from the time individuals start boot camp through contract completion. Figure 2 is derived from data on male non-prior-service regulars who entered the Marines in 1980 for a 4-year term. Individuals who extend their contracts or reenlist are not counted as having separated. (Please note that figures 1 and 2 represent different years; thus the graphs show different attrition levels.) The highest rate of attrition within the first term occurs during boot camp, which comprises approximately the first 12 weeks of the training program (first period, figure 2). The attrition rate declines after the completion of initial-skill training and remains at a relatively low level until the 13th period, when 4-year contracts are usually terminated. Although the level of post-training attrition per period is low, the total attrition that occurs during this 3-year period is significant, as shown in figure 1.

The probability an individual will leave the service varies with education, which this analysis divides into two levels, high school graduates (HSGs) and nongraduates (NHSGs). As shown in figures 3 and 4, data from 1980 and 1984 on regular non-prior-service males reveal that attrition rates differ significantly across educational levels. In figure 3, DEP and boot-camp attrition are calculated from 1984 data while initial-skill and post-training attrition are calculated from 1980 data. The separation rate by 120-day periods, from the start of boot camp to contract completion, is shown in figure 4. The data are for 1980 and include normal contract terminations during the

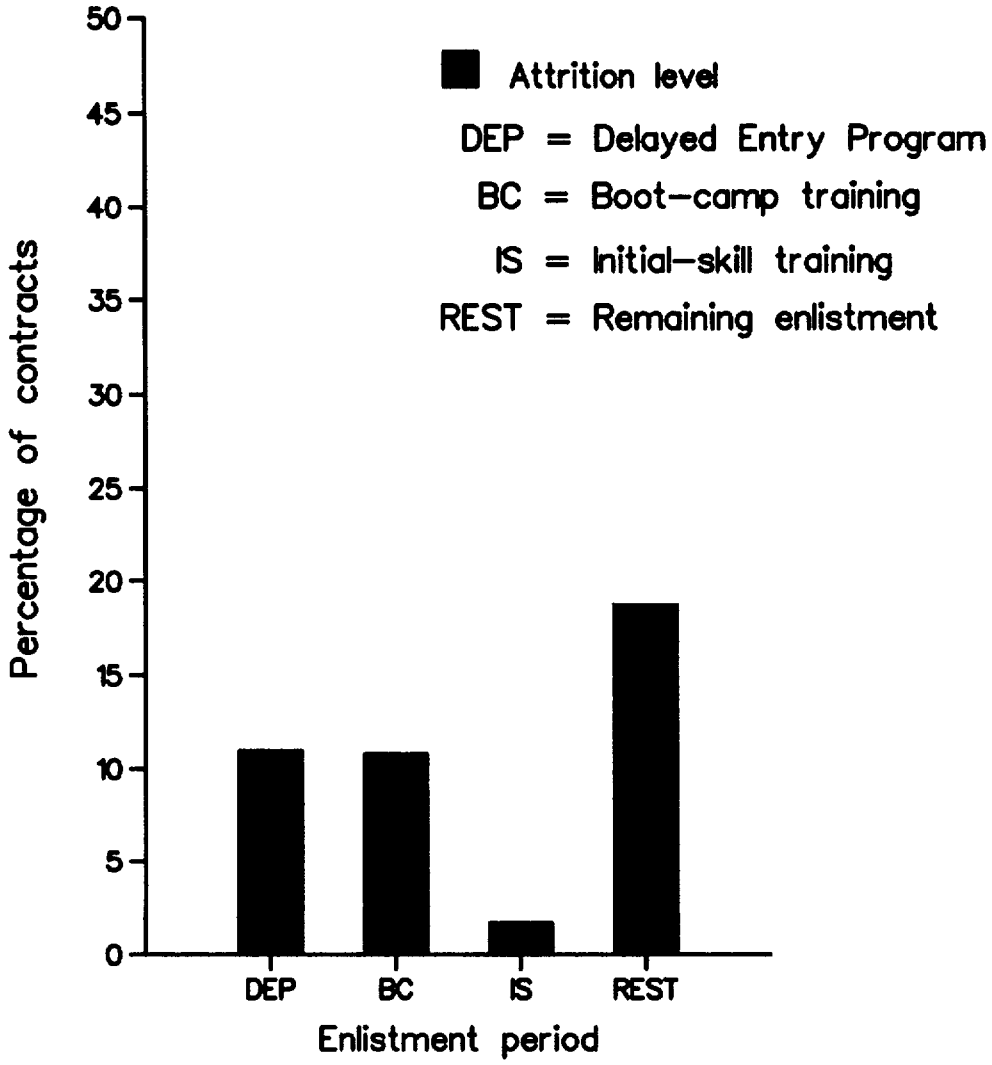


FIG. 1: ATTRITION RATE BY PHASE OF ENLISTMENT

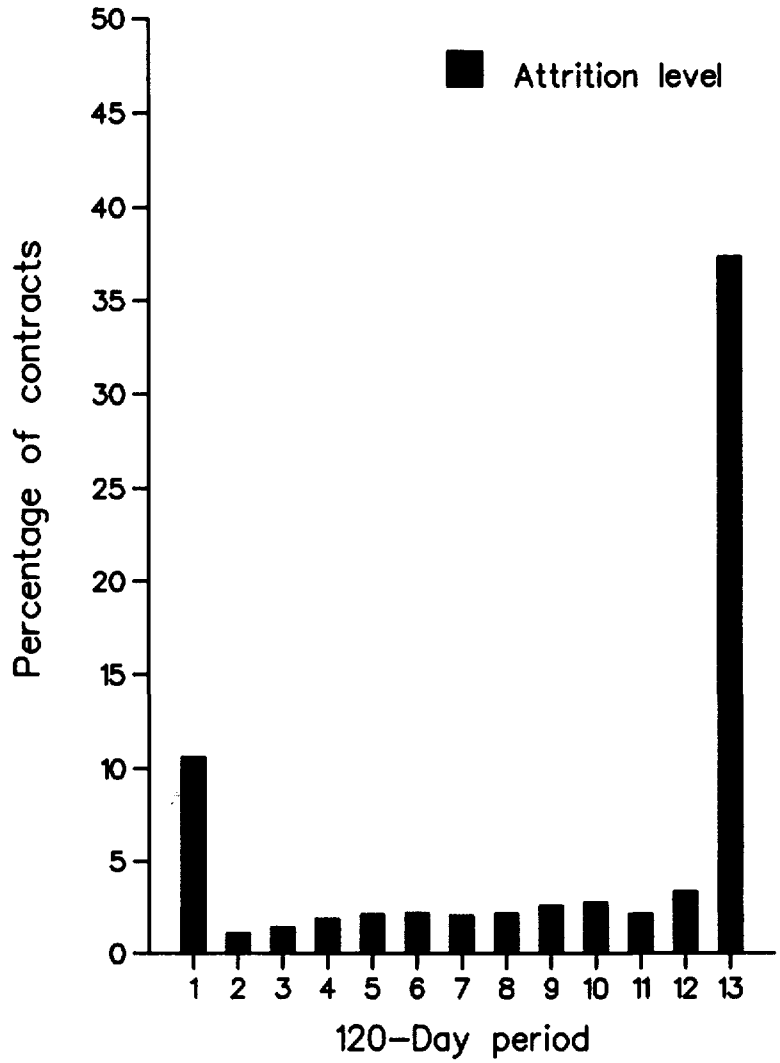


FIG. 2: ATTRITION RATE BY 120-DAY PERIOD

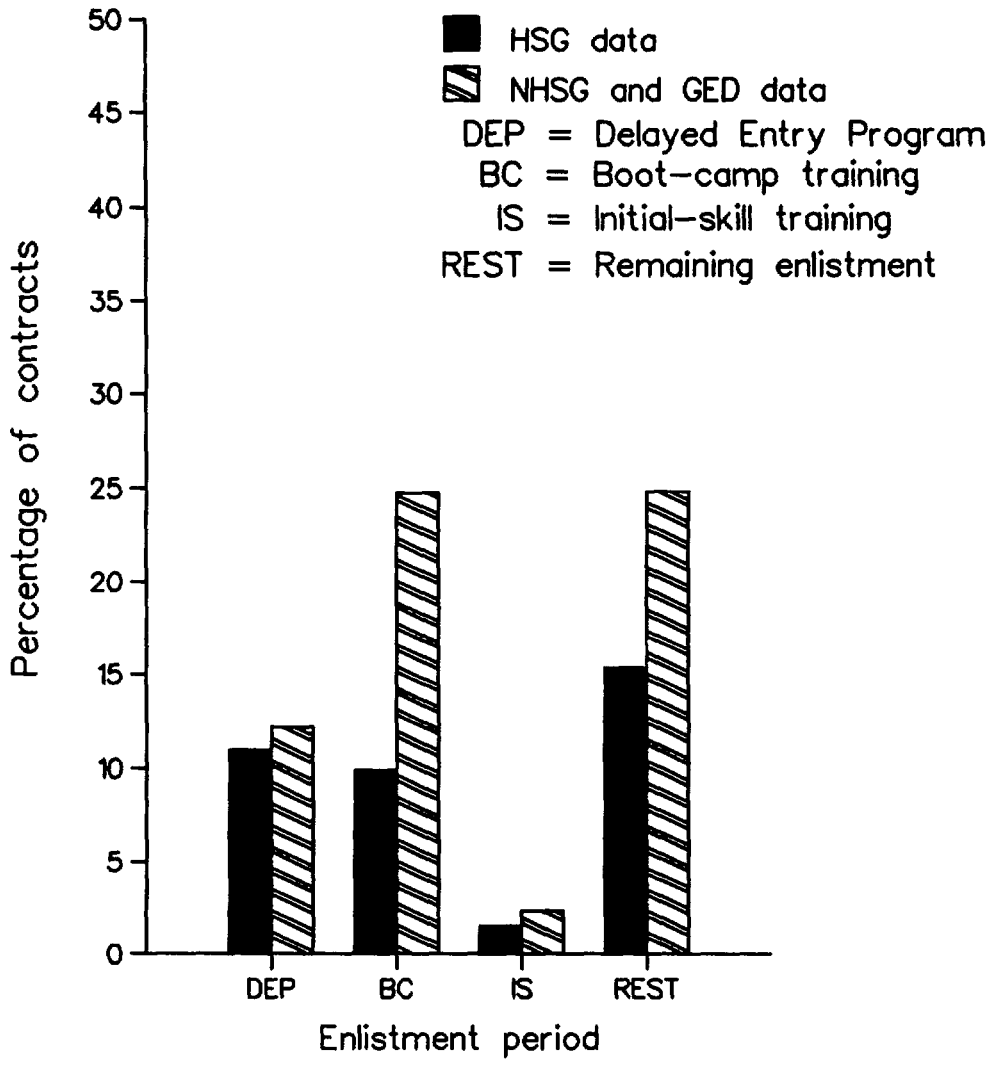


FIG. 3: ATTRITION RATE BY ENLISTMENT PHASE AND EDUCATION LEVEL

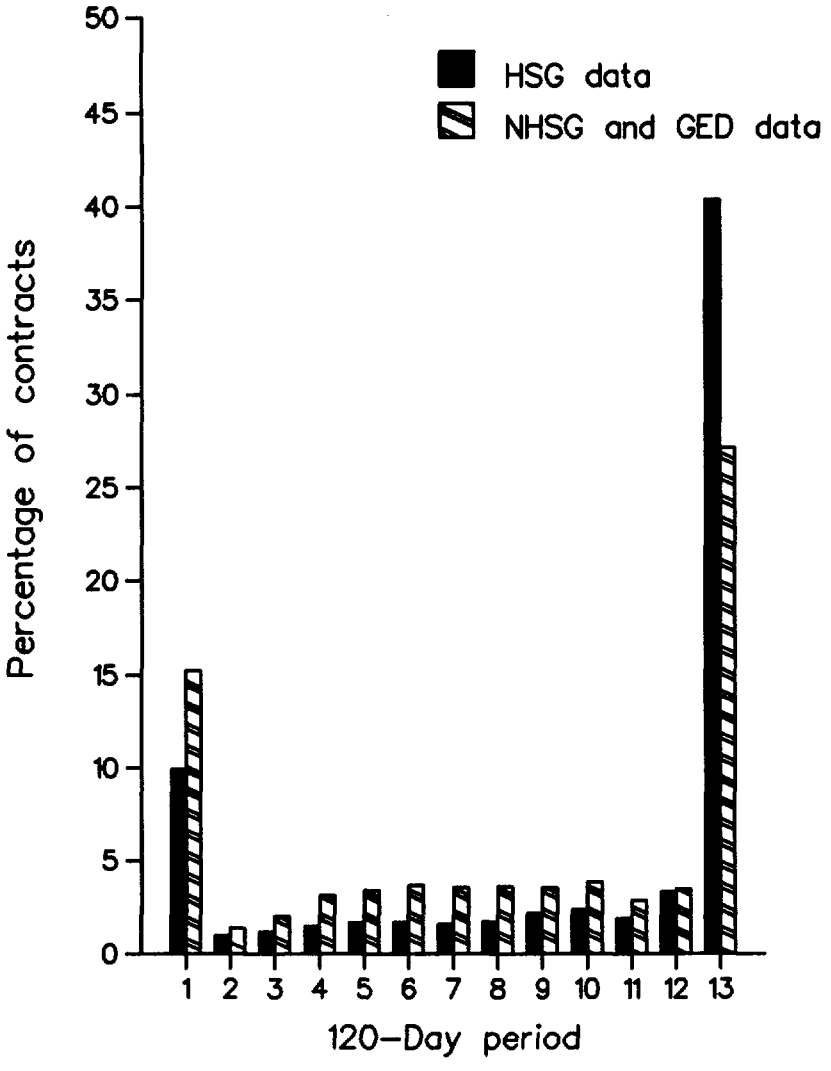


FIG. 4: ATTRITION RATE BY 120-DAY PERIOD AND EDUCATION LEVEL

13th period. Individuals who extend or reenlist are not counted as having separated. Both graphs demonstrate that HSGs have lower attrition rates than NHSGs during all phases of the enlistment period. Individuals who possess a Certificate of High School Equivalency (GED) have basically the same attrition pattern as the NHSGs.

Attrition rates also vary with mental ability. The Marine Corps measures general mental aptitude by the percentile scores of the AFQT, which is given to all Marine Corps applicants. Using 1980 data on male non-prior-service regulars, figure 5 shows that attrition rates are lower for the higher-ability AFQT categories (I through IIIa). Figure 5 represents the total attrition that occurs between the time a recruit starts boot camp and completes the enlistment term.

A somewhat similar pattern emerges when controlling for both ability and education. Figure 6 gives the total attrition between boot camp and contract completion by AFQT and educational levels. For HSGs, the attrition rate rises as ability level falls. For NHSGs and GEDs the pattern is less clear, although Marines in the low-ability groups tend to leave the Marine Corps at a higher rate.

## ATTRITION IN THE MAJOR PHASES OF FIRST-TERM ENLISTMENT

### Attrition From the DEP

Most individuals who enlist in the Marines do not directly ship to boot camp. Instead, recruits generally spend a period of time in the DEP, which can vary from less than a month to a full year. Attrition during this phase is significant. Table 1 gives the DEP attrition rate by personnel category for FY 1984. In that year, 11.1 percent of the regular, non-prior-service males who signed a contract left the Marine Corps while in the DEP.

Although attrition from the DEP varies across personnel types, attrition does not appear to be highly correlated with educational level. The DEP attrition rate varies only slightly across educational groups. The FY 1984 attrition rate for male non-prior-service regulars who are HSGs or in their senior year of high school when they sign their contracts is 11.0 percent. Similarly, 11.4 percent of the NHSGs leave the DEP. The attrition rate for GEDs is higher; 15.7 percent of the GEDs leave during the DEP.

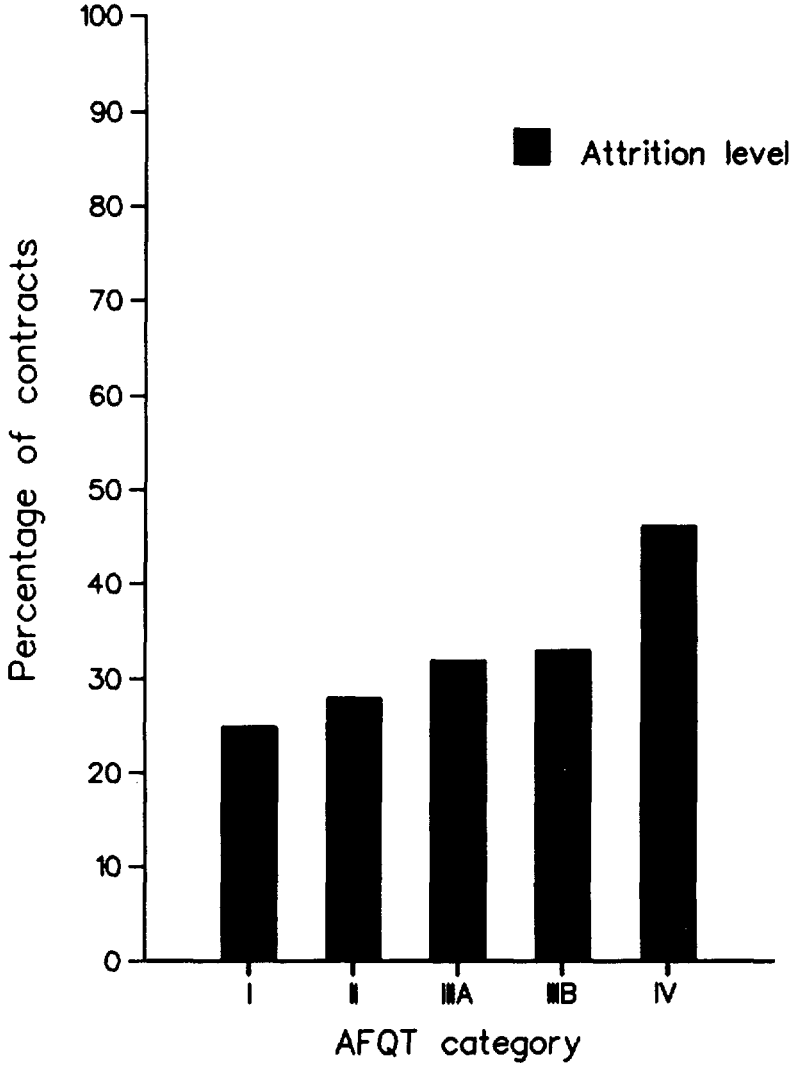


FIG. 5: ATTRITION RATE BY AFQT CATEGORY

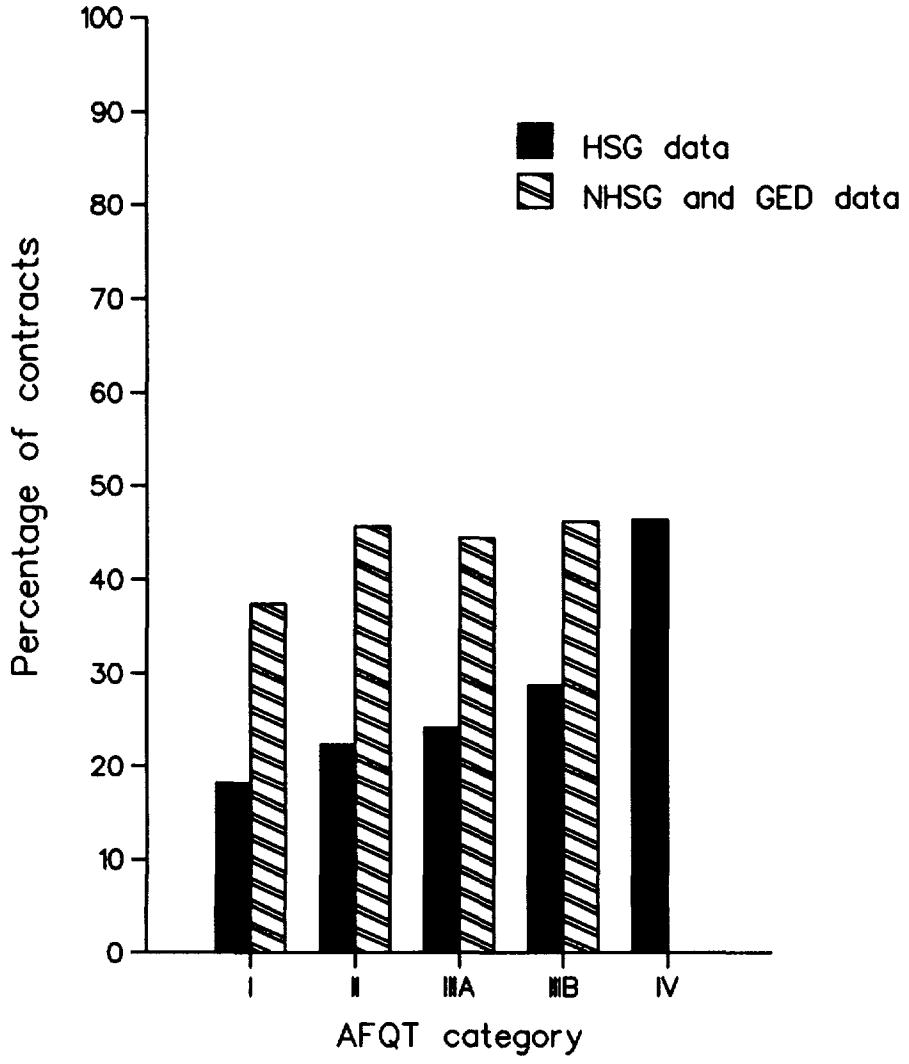


FIG. 6: ATTRITION RATE BY AFQT CATEGORY AND EDUCATION LEVEL

TABLE 1

RATE OF ATTRITION FROM THE DEP BY PERSONNEL CATEGORY

| Personnel category[a] | Attrition rate (percentage of contracts) |
|---|---|
| All recruits | 11.1 |
| HSGs | 11.0 |
| NHSGs and GEDs | 12.2 |
| NHSGs | 11.4 |
| GEDs | 15.7 |
| Cat. I-IIIa | 10.5 |
| Cat. I | 14.0 |
| Cat. II | 10.1 |
| Cat. IIIa | 10.6 |
| Cat. IIIb-IV | 11.5 |
| Cat. IIIb | 11.6 |
| Cat. IV | 10.9 |
| All HSGs; NHSGs and GEDs, Cat. I-IIIa | 10.5 |
| HSGs, Cat. I | 14.4 |
| HSGs, Cat. II | 10.1 |
| HSGs, Cat. IIIa | 10.6 |
| HSGs, Cat. IIIb | 11.4 |
| HSGs, Cat. IV | 10.9 |
| NHSGs and GEDs, Cat. I | 6.4 |
| NHSGs and GEDs, Cat. II | 11.0 |
| NHSGs and GEDs, Cat. IIIa | 10.5 |
| NHSGs and GEDs, Cat. IIIb | 16.5 |

a. Sample is composed of male non-prior-service regulars.

The DEP attrition rate varies across ability levels, but, as with education, there is no distinct pattern to this variation. The attrition rate for individuals who are in ability category I is the highest, at 14.0 percent. The attrition rates for individuals in ability categories II, IIIa, IIIb, and IV, however, are 10.1, 10.6, 11.6, and 10.9 percent, respectively.

Controlling for both education and ability reveals that the DEP attrition rate does not systematically vary across ability levels within a specific education group. There is no pattern to the variation of DEP attrition across both education and ability levels.

The cost the Marine Corps incurs when an individual leaves the DEP is equal to the expense of recruiting a replacement. The cost of DEP attrition is basically independent of the length of time the individual spends in the DEP pool because there are virtually no DEP carrying costs. The cost of recruiting varies with the quality of the recruit. Recruiting HSGs is more difficult than recruiting NHSGs and GEDs because graduates have better opportunities in the job market. For the same reason, recruiting high-ability people is presumed to be more difficult than recruiting low-ability people; thus the cost of DEP attrition, which equals the cost of recruiting, rises with the educational and ability level of the individual.

Three criteria are used to define the quality of personnel: education, ability, and a mix of these two standards. The first is education—specifically, the possession of a high school diploma. Those personnel with a diploma, the HSGs, are high-quality personnel; those without a diploma, the NHSGs and GEDs, are low-quality personnel. This criterion obviously gives a broad definition of quality. The second criterion is ability—specifically, an individual's AFQT category. High-quality personnel are in category IIIa or above; low-quality personnel, in category IIIb or below. This criterion is somewhat more stringent than the first because personnel must have an above-average level of ability to be considered high quality. The third criterion establishes quality by both education and ability. High-quality personnel include all HSGs and any NHSGs and GEDs who are in AFQT category IIIa or above; low-quality personnel include NHSGs and GEDs in category IIIb. This criterion gives the broadest definition of quality.

The total cost of recruiting is assumed to be primarily comprised of variable costs. Only the costs of advertising, enlistment bonuses, and recruiter training are treated as fixed costs. The costs of the support staff and active recruiting are both treated as variable costs; thus the marginal cost of recruiting consists of support costs and active-recruiting costs. The total cost of support is assumed to contract and expand linearly with the number of recruits; thus the support-staff component of the marginal cost of recruiting is assumed to be constant and the same for all recruits. In contrast, the amount of active recruiting needed to get an additional recruit is assumed to vary and depends on the quality of the recruit.

The amount of active recruiting that is needed to get an additional contract depends also on the supply of recruits. The supply of low-quality personnel is assumed to be unlimited. Under the assumption of unlimited supply, the amount of active recruiting needed to get another low-quality recruit equals the cost of processing a walk-in candidate. For low-quality recruits, the component costs of the support staff and active recruiting are assumed to be constant, so the marginal cost of recruiting a low-quality individual also is assumed constant.

The supply of interested, high-quality candidates is assumed to be limited. Over the relevant range, the supply curve for high-quality personnel is initially horizontal. However, after the supply of interested, high-quality candidates is exhausted, the supply curve turns upward. Recruiters must persuade individuals to enlist, so obtaining high-quality people is progressively more time-consuming and thus costly. The amount of active recruiting needed to get additional high-quality people rises with the number of high-quality accessions. Thus the marginal cost of recruiting high-quality people, which is comprised of the constant support component and the rising active-recruiting component, rises with the number of high-quality contracts. The cost associated with recruiting an extra individual to replace a high-quality accession who leaves prematurely equals the marginal recruiting cost; thus the cost of recruiting a replacement exceeds the cost of initially recruiting the individual who leaves the service.

The cost of recruiting low-quality personnel is not directly known. As explained in appendix A, the support cost associated with running the recruiting network is $1,439 per contract. In addition, a recruiter takes from 1 to 5 working days to process a walk-in applicant. The average cost of a month of active recruiting is $2,267 (appendix A). Using 3.65 days (12 percent of a month) of active recruiting as an average processing time for a walk-in candidate, the marginal cost of recruiting a low-quality individual is estimated to equal $1,711 ($0.12 \times \$2,267 + \$1,439$).

The marginal cost of recruiting high-quality personnel is estimated from an enlistment-supply equation. Due to data constraints, a single enlistment-supply equation is estimated for all high-quality personnel. In reality, different supply conditions are expected to exist for different types of high-quality personnel. However, data are available on only the aggregate recruiting effort; in other words, the data do not show how production recruiters divide their time among different types of recruits. The time recruiters spend acquiring high-quality individuals can be approximated by subtracting the estimated time they spend getting low-quality people

(3.65 days per recruit) from the total recruiting effort. In contrast, the amount of time a recruiter spends getting a certain type of high-quality person is assumed to vary with the number of recruits of that type, so estimating how recruiters divide their time across different types of high-quality personnel is difficult. Thus only a general estimate for the marginal cost of acquiring high-quality personnel is calculated.

As shown in appendix B, the marginal cost of recruiting different types of personnel is calculated from an estimated enlistment-supply equation. Due to data constraints, the enlistment-supply equation is estimated using cross-sectional data from 1978. Although the economic variables are adjusted to reflect the current situation, the estimated supply curve serves as only an approximate measure of current supply conditions. The enlistment-supply equation gives the relationship between the number of accessions and the amount of active recruiting effort expended. The recruiting effort in obtaining an additional recruit is converted to a cost measure to yield an estimated marginal recruiting cost. Table 2 gives the marginal recruiting cost for different types of personnel as a function of the number of contracts, $C$, of that type.

TABLE 2

MARGINAL COST OF RECRUITING BY PERSONNEL CATEGORY

| Personnel category | Definition | Cost |
|---|---|---|
| **High-quality personnel** | | |
| Defined by education | HSG | $\$1{,}439 + 9.1\,C^{.56}$ |
| Defined by ability | AFQT I, II, IIIa | $\$1{,}439 + .0023\,C^{1.5}$ |
| Defined by ability and education | HSG<br>NHSG AFQT I, II, IIIa[a] | $\$1{,}439 + 13.2\,C^{.49}$ |
| **Low-quality personnel** | | |
| Defined by education | NHSG[a] | $1,711 |
| Defined by ability | AFQT IIIb, IV | $1,711 |
| Defined by ability and education | NHSG AFQT IIIb[a] | $1,711 |

a. Includes GEDs.

The expected total cost of DEP attrition per contract equals the marginal cost of recruiting times the attrition rate. The attrition rate is known for finely defined personnel categories (as listed in table 1). However, estimates of the marginal cost of recruiting are available for only broadly defined personnel categories (as listed in table 2). Thus the expected cost of attrition is calculated for only the broadly defined categories. The estimates of the marginal costs of recruiting can be used as proxies for the cost of recruiting personnel from more finely defined educational and ability categories. Thus the approach presented here can be used to approximate the cost of attrition for more finely defined personnel categories.

The expected cost of DEP attrition varies across personnel types because both attrition rates and recruiting costs vary across these categories. The expected total cost of DEP attrition is presented in table 3 using the actual DEP attrition rates for FY 1984 and FY 1985 recruiting costs.

**TABLE 3**

**EXPECTED TOTAL COST OF ATTRITION FROM THE DEP BY PERSONNEL CATEGORY**
**(Per contract)**

| Personnel category | Cost |
|---|---|
| **High-quality personnel** | |
| Defined by education | $.110(\$1{,}439 + 9.1\,C^{.56}) = \$158 + 1.0\,C^{.56}$ |
| Defined by ability | $.105(\$1{,}439 + .0023\,C^{1.5}) = \$151 + .0002\,C^{1.5}$ |
| Defined by ability and education | $.105(\$1{,}439 + 13.2\,C^{.49}) = \$151 + 1.4\,C^{.49}$ |
| **Low-quality personnel** | |
| Defined by education | $.122 \times \$1{,}711 = \$209$ |
| Defined by ability | $.115 \times \$1{,}711 = \$197$ |
| Defined by ability and education | $.165 \times \$1{,}711 = \$282$ |

## Attrition From Boot Camp

Most attrition occurs during boot camp. Approximately 10.8 percent of the non-prior-service male contracts leave during boot camp. Boot camp consists of 10 weeks of formal training plus administrative time and lasts, on average, 87 days. Individuals who leave during boot camp stay for approximately 42.2 days on average, which is about half the length of recruit training. Time served before attrition does not systematically vary with an individual's ability or education and is basically the same for all personnel.

The boot-camp attrition rate is much lower for HSGs than it is for NHSGs and GEDs. Table 4 gives the boot-camp attrition rate by personnel category. Data from 1984 show that approximately 9.9 percent of the non-prior-service HSG males who sign a contract leave the Marine Corps during boot camp. In contrast, 25.9 percent of the NHSGs and 18.9 percent of the GEDs leave before completing boot camp.

TABLE 4

RATE OF ATTRITION FROM BOOT CAMP BY PERSONNEL CATEGORY

| Personnel category[a] | Attrition rate (percentage of contracts) |
|---|---|
| All recruits | 10.8 |
| HSGs | 9.9 |
| NHSGs and GEDs | 24.7 |
| NHSGs | 25.9 |
| GEDs | 18.9 |
| Cat. I-IIIa | 10.4 |
| Cat. I | 10.8 |
| Cat. II | 9.6 |
| Cat. IIIa | 11.4 |
| Cat. IIIb-IV | 11.4 |
| Cat. IIIb | 11.4 |
| Cat. IV | 18.7 |
| All HSGs; NHSGs and GEDs, Cat. I-IIIa | 8.8 |
| HSGs, Cat. I | 6.0 |
| HSGs, Cat. II | 6.8 |
| HSGs, Cat. IIIa | 7.2 |
| HSGs, Cat. IIIb | 9.2 |
| HSGs, Cat. IV | 18.7 |
| NHSGs and GEDs, Cat. I | 7.6 |
| NHSGs and GEDs, Cat. II | 14.4 |
| NHSGs and GEDs, Cat. IIIa | 12.6 |
| NHSGs and GEDs, Cat. IIIb | 15.1 |

a. Sample is composed of male non-prior-service regulars.

The boot-camp attrition rate also varies across ability levels, although the differences in the attrition rates are not as significant as with educational levels. In addition, no distinct pattern appears in the variation in attrition levels across ability groups. The FY 1984 attrition rate for categories I through IV are 10.8, 9.6, 11.4, and 18.7, respectively.

Controlling for education, the attrition rate is generally higher for low-ability groups. Data from 1980 reveal that the attrition level for HSGs is higher for low-ability groups. This result is true also for NHSGs and GEDs, although the pattern is more subtle.

The cost the Marine Corps incurs when an individual leaves during boot camp equals the cost of recruiting and training a replacement. The cost of recruiting a replacement is the same as the cost of DEP attrition. The cost of training a replacement equals all the expenditures the Marine Corps must make to train the replacement to the level of the individual who left. The marginal cost of training is assumed to be constant and the same for all personnel. As shown in appendix C, data from FY 1985 reveal that training an individual who completes boot camp costs $5,404. Individuals who leave during boot camp stay for approximately 48.8 percent of the course duration. Therefore, the Marine Corps spends $2,637 ($0.488 \times \$5,404 = \$2,637$) to train a replacement to the level of the average individual who leaves.

The expected total cost of boot-camp attrition equals the boot-camp attrition rate times the cost of recruiting and training an individual who leaves. Constructed from FY 1984 and 1980 attrition estimates and FY 1985 training cost measures, table 5 gives the expected cost of boot-camp attrition for the different types of personnel.

### Attrition From Initial-Skill Training

The length of initial-skill training varies significantly across occupational fields; therefore, measuring the aggregate attrition during this phase is difficult. Initial-skill training can last from 6 weeks to 2 years. The average length of initial-skill training is 83.4 days, and the attrition that occurs during this period provides the measure of attrition during this phase of enlistment. Individuals who leave during initial-skill training stay for approximately 25.5 days, which is about 30.5 percent of the training period.

TABLE 5

EXPECTED TOTAL COST OF ATTRITION FROM BOOT CAMP BY PERSONNEL CATEGORY
(Per contract)

| Personnel category | Cost |
|---|---|
| **High-quality personnel** | |
| Defined by education | $.099(\$1{,}439 + 9.1\,C^{.56} + \$2{,}637) = \$404 + .90\,C^{.56}$ |
| Defined by ability | $.104(\$1{,}439 + .0023\,C^{1.5} + \$2{,}637) = \$424 + .0002\,C^{1.5}$ |
| Defined by ability and education | $.088(\$1{,}439 + 13.2\,C^{.49} + \$2{,}637) = \$359 + 1.16\,C^{.49}$ |
| **Low-quality personnel** | |
| Defined by education | $.247(\$1{,}711 + \$2{,}637) = \$1{,}074$ |
| Defined by ability | $.114(\$1{,}711 + \$2{,}637) = \$496$ |
| Defined by ability and education | $.151(\$1{,}711 + \$2{,}637) = \$657$ |

Attrition from initial-skill training is generally low. Data from 1980 reveal that approximately 1.7 percent of the contracts are broken during initial-skill training. Table 6 shows the 1980 attrition rate from initial-skill training by personnel category. In terms of education, 1.5 percent of the HSGs leave during initial-skill training. In contrast, 2.5 percent of the NHSGs and 1.8 percent of the GEDs leave during initial-skill training.

The rate of attrition from initial-skill training is also generally low across ability groups. The rate does, however, increase as ability level declines; the 1980 attrition rates for ability categories range from 1.2 (category I) to 4.4 (category IV). In addition, the attrition rates are generally higher for the low-ability groups within an educational category.

The cost of attrition from initial-skill training equals the cost of recruiting and training a replacement. Training an individual who completes boot camp costs $5,404. As shown in appendix C, the average cost of an individual's completed initial-skill training, using FY 1985 data, is $6,282.

TABLE 6

RATE OF ATTRITION FROM INITIAL-SKILL TRAINING BY PERSONNEL CATEGORY

| Personnel category[a] | Attrition rate (percentage of contracts) |
|---|---|
| All recruits | 1.7 |
| HSGs | 1.5 |
| NHSGs and GEDs | 2.3 |
| NHSGs | 2.5 |
| GEDs | 1.8 |
| Cat. I-IIIa | 1.5 |
| Cat. I | 1.2 |
| Cat. II | 1.5 |
| Cat. IIIa | 1.6 |
| Cat. IIIb-IV | 2.0 |
| Cat. IIIb | 1.9 |
| Cat. IV | 4.4 |
| All HSGs; NHSGs and GEDs, Cat. I-IIIa | 1.6 |
| HSGs, Cat. I | 1.0 |
| HSGs, Cat. II | 1.3 |
| HSGs, Cat. IIIa | 1.4 |
| HSGs, Cat. IIIb | 1.6 |
| HSGs, Cat. IV | 4.4 |
| NHSGs and GEDs, Cat. I | 3.4 |
| NHSGs and GEDs, Cat. II | 1.9 |
| NHSGs and GEDs, Cat. IIIa | 2.1 |
| NHSGs and GEDs, Cat. IIIb | 2.5 |

a. Sample is composed of male non-prior-service regulars.

The typical individual who leaves during initial-skill training stays for 30.5 percent of the program. Therefore, the Marine Corps spends $7,320 ($6,282 × 0.305 + $5,404 = $7,320) to train a replacement for an individual who leaves during initial-skill training. The cost of recruiting a replacement must be added to the training expenditures to get the total cost of attrition from initial-skill training. Table 7 gives the expected total cost for different personnel, using 1980 attrition measures and FY 1985 training-cost figures.

TABLE 7

EXPECTED TOTAL COST OF ATTRITION FROM INITIAL-SKILL TRAINING BY PERSONNEL CATEGORY
(Per contract)

| Personnel category | Cost |
|---|---|
| **High-quality personnel** | |
| Defined by education | $.015(\$1{,}439 + 9.1\,C^{.56} + \$7{,}320) = \$131 + .14\,C^{.56}$ |
| Defined by ability | $.015(\$1{,}439 + .0023\,C^{1.5} + \$7{,}320) = \$131 + .00003\,C^{1.5}$ |
| Defined by ability and education | $.016(\$1{,}439 + 13.2\,C^{.49} + \$7{,}320) = \$140 + .21\,C^{.49}$ |
| **Low-quality personnel** | |
| Defined by education | $.023(\$1{,}711 + \$7{,}320) = \$208$ |
| Defined by ability | $.020(\$1{,}711 + \$7{,}320) = \$181$ |
| Defined by ability and education | $.025(\$1{,}711 + \$7{,}320) = \$226$ |

## Attrition During the Remainder of First-Term Enlistment

After the completion of initial-skill training, the attrition rate is relatively low and remains basically constant over the duration of the enlistment period. Approximately 1 to 3 percent of the accessions leave the service in each 120-day period, resulting in a total attrition rate after initial-skill training of 18.8 percent. Table 8 gives the 1980 post-training attrition rate for different personnel categories.

The 1980 attrition rate after initial-skill training is higher for NHSGs and GEDs than for HSGs. NHSGs and GEDs have an average post-training attrition rate of approximately 2 to 3 percent every 120-day period, totaling 25.0 percent overall. The post-training attrition rate for HSGs is about 1 to 2 percent every 120-day period and totals 15.9 percent.

The 1980 post-training attrition rate also varies significantly across ability levels. Post-training attrition increases as ability level falls. The post-training attrition level is 12.9 percent for category I individuals and

TABLE 8

RATE OF POST-TRAINING ATTRITION
BY PERSONNEL CATEGORY

| Personnel category[a] | Attrition rate (percentage of contracts) |
|---|---|
| All recruits | 18.8 |
| HSGs | 15.9 |
| NHSGs and GEDs | 25.0 |
| NHSGs | 25.5 |
| GEDs | 24.8 |
| Cat. I-IIIa | 17.7 |
| Cat. I | 12.9 |
| Cat. II | 16.9 |
| Cat. IIIa | 18.9 |
| Cat. IIIb-IV | 19.7 |
| Cat. IIIb | 19.7 |
| Cat. IV | 23.1 |
| All HSGs; NHSGs and GEDs, Cat. I-IIIa | 18.2 |
| HSGs, Cat. I | 11.6 |
| HSGs, Cat. II | 14.0 |
| HSGs, Cat. IIIa | 15.5 |
| HSGs, Cat. IIIb | 17.9 |
| HSGs, Cat. IV | 23.1 |
| NHSGs and GEDs, Cat. I | 26.3 |
| NHSGs and GEDs, Cat. II | 29.2 |
| NHSGs and GEDs, Cat. IIIa | 29.7 |
| NHSGs and GEDs, Cat. IIIb | 28.5 |

a. Sample is composed of male non-prior-service regulars.

climbs to 23.1 percent for category IV individuals. A similar pattern exists across ability levels within an educational group. For each educational level, post-training attrition rises as ability falls. Although attrition rates during the training period do not vary significantly by ability group, the attrition level while individuals are on the job is highly correlated with ability.

Quantifying the cost of post-training attrition is difficult because it is not known when, in an individual's enlistment, the Marine Corps recoups its investment in recruiting and training. The Marine Corps could recoup some of its investment by paying new recruits a lower wage than senior personnel

for the same quality and quantity of work. The Marine Corps may pay new personnel low wages because it is implicitly paying them by providing training.

A simple example illustrates the concept of recouping an investment. Suppose an experienced individual produces $100-worth of output in one period and is paid $100. A new recruit also produces $100-worth of output in one period but is paid $50. In addition, suppose it costs $100 to recruit and train individuals. If the new recruit quits after one work period (ignoring discounting), the attrition implicitly costs the Marine Corps $50. Because, in this example, new recruits are paid less than senior personnel for the same work, the Marine Corps is able to recoup part of its investment (in this case $50) and the cost of post-training attrition is less than the cost of recruiting and training.

Under the current wage structure, the Marine Corps cannot recoup its investment in less than one term. Training a recruit costs $11,686 ($5,404 + $6,282 = $11,686). The marginal support cost associated with recruiting an individual is $1,439. The marginal active-recruiting cost varies across personnel categories. Thus, at the minimum, the cost of recruiting and training a recruit exceeds $13,125 ($11,686 + $1,439 = $13,125). The wage gap between senior first-term personnel and new recruits is less than the cost of training and recruiting. For the typical 4-year enlistment, the post-training work period lasts approximately 3.5 years. An E-4 with 3 years of experience costs $46,025 over 3.5 years. In contrast, an E-1 costs $33,502. The difference in wages, $12,523, is less than the cost of training and recruiting. Therefore, even if the wage differential between E-1s and E-4s is due strictly to investment recouping (i.e., E-1s and E-4s are equally productive), the Marine Corps could not recoup its full investment in one term under the present wage structure.

Because it is difficult to measure the output of a Marine in an economically meaningful way, the degree of investment recouping cannot be easily determined. As a lower-bound estimate of the cost of post-training attrition, the Marine Corps is assumed to recoup its investment in 3.5 years. This assumption clearly overstates the degree of investment recouping that actually occurs and thus results in an underestimation of the cost of post-training attrition.

The Marine Corps is assumed to recoup its investment evenly over the post-training period. In addition, for each personnel category, the attrition rate remains basically the same throughout the post-training period. Assuming that investment recouping occurs evenly, and given the even spread of post-training attrition over time, approximately one-half of the investment in recruiting and training is recouped when the typical individual leaves in the post-training period. Thus, the average cost of post-training attrition equals approximately 0.50 times the marginal cost of recruiting and training ($5,404 + $6,282 = $11,686). Table 9 gives the expected total cost of post-training attrition for different personnel, using 1980 through 1984 post-training attrition rates and FY 1985 training and recruiting costs.

**TABLE 9**

**EXPECTED TOTAL COST OF POST-TRAINING ATTRITION BY PERSONNEL CATEGORY**
**(Per contract)**

| Personnel category | Cost |
|---|---|
| **High-quality personnel** | |
| Defined by education | $.159(.50)(\$1{,}439 + 9.1\,C^{.56} + \$11{,}686) = \$1{,}043 + .72\,C^{.56}$ |
| Defined by ability | $.177(.50)(\$1{,}439 + .0023\,C^{1.5} + \$11{,}686) = \$1{,}162 + .0002\,C^{1.5}$ |
| Defined by ability and education | $.182(.50)(\$1{,}439 + 13.2\,C^{.49} + \$11{,}686) = \$1{,}194 + 1.20\,C^{.49}$ |
| **Low-quality personnel** | |
| Defined by education | $.250(.50)(\$1{,}711 + \$11{,}686) = \$1{,}675$ |
| Defined by ability | $.197(.50)(\$1{,}711 + \$11{,}686) = \$1{,}320$ |
| Defined by ability and education | $.285(.50)(\$1{,}711 + \$11{,}686) = \$1{,}909$ |

## EXPECTED TOTAL COST OF ATTRITION BY PERSONNEL CATEGORY

The expected total attrition costs associated with different personnel vary because the attrition levels and cost of recruiting are different. For each personnel type, the expected total cost of attrition equals the sum of the cost of each type of attrition times the probability of each type of attrition. Table 10 gives the expected total costs of first-term attrition by personnel category by summing the results from tables 3, 5, 7, and 9.

TABLE 10

EXPECTED TOTAL COST OF FIRST-TERM ATTRITION
BY PERSONNEL CATEGORY
(Per contract)

| Personnel category | Number of contracts 10,000 | 20,000 | 40,000 |
|---|---|---|---|
| **High-quality personnel** | | | |
| Defined by education $\$1{,}736 + 2.76\,C^{.56}$ | $2,216 | $2,443 | $2,778 |
| Defined by ability $\$1{,}868 + .00063\,C^{1.5}$ | 2,498 | 3,650 | 6,908 |
| Defined by ability and education $\$1{,}844 + 3.97\,C^{.49}$ | 2,206 | 2,353 | 2,558 |
| **Low-quality personnel** | | | |
| Defined by education | 3,166 | 3,166 | 3,166 |
| Defined by ability | 2,194 | 2,194 | 2,194 |
| Defined by ability and education | 3,074 | 3,074 | 3,074 |

The cost of attrition is generally higher for NHSGs than HSGs. The expected cost of attrition associated with an NHSG or GED contract is $3,166. Thus, the Marine Corps is expected to incur a cost of $3,166 for every NHSG and GED contract due to attrition.

The expected cost of attrition for HSGs varies with the number of HSG contracts. As more HSGs are recruited, the expected cost of attrition rises because the marginal cost of recruiting an HSG rises, which results in higher replacement costs. HSGs have low attrition rates; thus the expected cost of attrition for HSGs is less than the expected cost of attrition for NHSGs and GEDs.

The expected cost of attrition associated with high-ability people is significantly greater than the cost of attrition associated with low-ability people. The attrition rate is similar across ability categories, but the recruiting cost varies dramatically. The cost of recruiting low-ability personnel is assumed to be constant. In contrast, the estimated cost of recruiting high-ability personnel is quite high and increases rapidly as the number of

recruits rises. The high estimates for the cost of recruiting high-ability personnel are most likely a result of how this category is defined. High-ability personnel are stringently defined as individuals with above-average ability; thus this group is expected to be difficult to recruit. When a large number of high-ability people are recruited, the replacement cost becomes large. Given the attrition rate varies only slightly across personnel types, the relatively high cost of replacing high-ability personnel results in a relatively high expected attrition cost.

In contrast, when the personnel categories are defined by both education and ability, the expected cost of attrition is higher for low-quality personnel. The attrition rate for HSGs and high-ability NHSGs and GEDs is relatively low compared to the attrition rate of low-ability NHSGs and GEDs. The attrition rate of low-quality personnel is basically determined by educational level because attrition does not vary significantly across ability levels. The high attrition rate of low-quality personnel results in a high expected attrition cost for this group.

## CONCLUSION

The relative cost of attrition associated with the quality of personnel depends on how the personnel categories are defined. When high-quality personnel are defined by educational level or a mix of the ability and educational criteria, the cost of attrition associated with high-quality personnel is generally lower than the cost of attrition associated with low-quality personnel. Different results are obtained when personnel categories are defined in terms of just ability. The attrition cost associated with high-ability personnel is consistently higher than the cost of attrition for low-ability people. The high cost of attrition associated with high-ability people is primarily due to the fact that high-ability personnel are expensive to recruit, but as a group they do not display a lower attrition level than low-ability people.

Attrition is expensive for all personnel categories. Attrition costs the Marine Corps from $2,194 to $6,908 per contract. Given the Marine Corps recruits over 40,000 non-prior-service individuals each year, the Corps spends in excess of $87 million on people who leave the service before they complete their contracts.

To choose personnel cost effectively, the Marine Corps must weigh the costs of recruiting and training against the cost of attrition. In addition, an individual's expected performance must be considered. Attrition costs are

generally lowest for HSGs and low-ability personnel. However, when both ability and education are considered, attrition costs are lowest for HSGs and high-ability NHSGs and GEDs. Although the attrition cost is low for HSGs and high-ability NHSGs and GEDs, these individuals are expensive to recruit. Thus, the total cost of a HSG or a high-ability NHSG or GED, which is the sum of the attrition, recruiting, and training costs, is high. In contrast, low-ability personnel generally have a high rate, thus high cost, of attrition, but they are relatively inexpensive to obtain. Although low-ability personnel are inexpensive, they do not perform as well as high-ability personnel. Therefore, although attrition costs are an important factor, the minimization of attrition costs should not be the sole criterion for choosing the mix of personnel.

# APPENDIX A

## RECRUITING COSTS

The marginal cost of recruiting enlisted personnel is divided into two basic categories: support costs and active-recruiting costs. Support costs include all the costs associated with supporting the active recruiting effort. Active-recruiting costs are the direct costs associated with production recruiters.

Table A-1 gives the recruiter assignments for FY 1985. Table A-2 shows the support costs of recruiting in that year. Support costs include all of the costs of obtaining reservists. In addition, the category entitled "other support costs" includes the cost of obtaining officers. Thus, the support costs associated with just obtaining regular enlisted personnel must be estimated. The support costs are estimated using recruiter assignments as a proxy for the percentage of the total cost that is spent on enlisted regulars. As shown in table A-2, the percentage of recruiters who were assigned to regular enlisted recruits is used to estimate the support costs associated with recruiting regular enlisted personnel. The total overhead cost of recruiting was $63,458,620. There were approximately 44,107 contracts signed in FY 1985. Therefore, the average support cost per contract is $1,439.

TABLE A-1

RECRUITING ASSIGNMENTS FOR FY 1985

| | Work-years | Percentage of recruiters in the program | Percentage of total recruiters |
|---|---|---|---|
| **Enlisted program** | | | |
| Regular recruiters | 2,487 | 92 | 86 |
| Reserve recruiters | 228 | 8 | 8 |
| **Officer program** | | | |
| Regular recruiters | 184 | 100 | 6 |
| Reserve recruiters | 0 | 0 | 0 |

SOURCE: U.S. Marine Corps, MCO P7000.14, *Marine Corps Cost Factors Manual*, Jun 1985.

TABLE A-2

RECRUITING SUPPORT COSTS

| Cost category | Total cost of the regular enlisted program (thousands of dollars) |
|---|---|
| Headquarters personnel | $ 2,246 × .92 = $ 2,066.32 |
| Field personnel | $31,173 × .92 = 28,679.16 |
| Recruit depot staff | $ 1,312 × .92 = 1,207.04 |
| Other support costs | $36,635 × .86 = 31,506.10 |
| Total overhead cost | $63,458.62 |

SOURCE: U.S. Marine Corps, MCO P7000.14, *Marine Corps Cost Factors Manual*, Jun 1985.

The total cost of active recruiting aimed at obtaining regular enlisted personnel includes the direct costs of recruiters, recruiter assistants, and command recruiters. The cost of recruiters and recruiter assistants assigned to regular enlisted personnel is directly known. The cost of command recruiting includes the costs of reservists. Thus the cost of command recruiting directed at regulars must be estimated from recruiter assignments. The total cost of active recruiting is given in table A-3. The cost per work-month of recruiting effort is obtained by dividing the total cost of active recruiting by the number of work-years of recruiting, which is 2,487. This figure is converted to the cost per month by dividing by 12. Thus, the average cost of 1 work-month of active recruiting is $2,267.

## TABLE A-3

## THE TOTAL COST OF ACTIVE RECRUITING IN FY 1985

| Cost category | Total cost of the regular enlisted program (thousands of dollars) |
|---|---|
| Command recruiting | $7,831 × .92 = $ 7,204.5 |
| Pay and allowance of recruiter assistants | 6,642.0 |
| Pay and allowance of recruiters | 53,803.0 |
| Total active-recruiting cost | $67,649.5 |

SOURCE: U.S. Marine Corps, MCO P7000.14, *Marine Corps Cost Factors Manual*, Jun 1985.

# APPENDIX B

## THE MARGINAL COST OF RECRUITING

The marginal cost of recruiting high-quality personnel is calculated from an enlistment-supply equation. An enlistment-supply function is estimated for all high-quality personnel, using cross-sectional data from 1978 (see appendix E). The unit of analysis is the recruiting substation. An exponential relationship is used to approximate the general relationship between enlistments and recruiting effort as follows:

$$Es = \alpha REs^{\beta} P^{\mu} U^{\gamma} \ , \tag{B-1}$$

where

$Es$ = the number of high-quality, regular, male, non-prior-service accessions from the recruiting substation

$REs$ = the total work-months of recruiting effort at the recruiting substation expended on high-quality personnel

$P$ = the population of male seniors in the high schools assigned to the recruiting substation

$U$ = the regional unemployment rate in the standard metropolitan area nearest to the recruiting substation.

The marginal recruiting effort, in terms of time, is calculated by estimating the enlistment-supply equation (equation B-1). Estimation is simplified by making the recruiting-effort equation linear. Taking the natural log of both sides of the equation transforms the supply equation as follows:

$$\ln Es = \ln \alpha + \beta \ln REs + \mu \ln P + \gamma \ln U \ . \tag{B-2}$$

The regression results are given in table B-1.

TABLE B-1

ESTIMATION OF THE ENLISTMENT-SUPPLY EQUATION

| Explanatory variables | Parameter estimates for high-quality personnel: By education | By ability | By ability and education |
|---|---|---|---|
| Constant (ln$\alpha$) | −1.20 | −2.36 | −.87 |
| | (1.87) | (4.0) | (1.51) |
| ln$RES$ | .64 | .40 | .67 |
| | (6.86) | (4.90) | (7.72) |
| ln$U$ | .23 | .19 | .20 |
| | (1.43) | (1.29) | (1.38) |
| ln$P$ | .27 | .50 | .25 |
| | (2.67) | (5.47) | (2.73) |
| $\bar{R}^2$ | .45 | .48 | .51 |

NOTE: $t$ statistics are shown in parentheses.

Inversion of the enlistment supply function yields the following relationship between recruiting effort and accessions:

$$RES = \left[\frac{Es}{\alpha P^{\mu} U^{\gamma}}\right]^{1/\beta} . \qquad \text{(B-3)}$$

The recruiting-effort equation gives the relationship between recruiting effort and the number of high-quality accessions. This relationship is translated to terms of the number of high-quality contracts so that the marginal recruiting effort per contract can be calculated. The relationship between accessions and contracts is:

$$Es = Cs(1 - ADEP) , \qquad \text{(B-4)}$$

where

$Cs$ = the number of male non-prior-service contracts at the recruiting substation

$ADEP$ = the number of individuals who quit while in the DEP divided by the number of contracts.

Thus, recruiting time expended can be easily translated from the time in terms of accessions to the time in terms of contracts as follows:

$$RE_s = \left[ \frac{C_s(1 - ADEP)}{\alpha P^{\mu} U^{\gamma}} \right]^{1/\beta} . \tag{B-5}$$

The above micro relationship between contracts and recruiting effort, at the recruiting substation, is converted to an aggregate relationship by expressing $C_s$ in terms of the aggregate number of contracts, $C$. Given there were approximately 680 recruiting substations in 1978, the number of contracts at the recruiting substation can be expressed in terms of the aggregate number of contracts, $C$, as in the following average relationship:

$$C_s = \frac{C}{680} . \tag{B-6}$$

Substituting the above expression into the recruiting effort equation yields:

$$RE_s = \left[ \frac{C/680\,(1 - ADEP)}{\alpha P^{\mu} U^{\gamma}} \right]^{1/\beta} . \tag{B-7}$$

Multiplying by the number of recruiting substations and rearranging yields an expression for the aggregate recruiting effort, $RE$, where:

$$RE = 680\, RE_s = \left[ \frac{C\,(1 - ADEP)}{\alpha P^{\mu} U^{\gamma}} \right]^{1/\beta} 680^{\,1-1/\beta} . \tag{B-8}$$

Taking the derivative of the above relationship yields:

$$\frac{\partial RE}{\partial C} = \frac{1}{\beta} \left[ \frac{(1 - ADEP)}{\alpha P^{\mu} U^{\gamma}} \right]^{1/\beta} C^{\,1/\beta - 1}\, 680^{\,1-1/\beta} , \tag{B-9}$$

which is the work-months of recruiting effort needed to recruit an additional high-quality contract.

The marginal recruiting effort expended by production recruiters (equation B-9), is calculated for high-quality personnel using the estimated parameters in table B-1 and the sample mean, 2,125, for $P$. Unemployment,

$U$, is set equal to 8 percent to adjust for current market conditions. The ratio of individuals who quit the DEP to the number of contracts, *ADEP*, for high-quality personnel is 0.105 if defined by ability, 0.110 if defined by education, and 0.105 if defined by both ability and education. The marginal recruiting effort expended by production recruiters on low-quality personnel is assumed to be constant and equals 3.65 days (0.12 months). The marginal recruiting effort expended by production recruiters, for each personnel type, is reported in table B-2. Multiplying the time it takes to get an additional person by the cost of a work-month of recruiting effort yields the marginal recruiting cost. As shown in appendix A, a work-month of recruiting effort costs $2,267. Table B-3 gives the total marginal recruiting cost, which includes the constant support cost, associated with different types of personnel.

**TABLE B-2**

**THE TOTAL AND MARGINAL RECRUITING EFFORT IN WORK-MONTHS BY PERSONNEL CATEGORY**

| Personnel category | Total recruiting effort | Marginal recruiting effort |
|---|---|---|
| **High-quality personnel** | | |
| Defined by education | $RE = .0027\,C^{1.56}$ | $\frac{\partial RE}{\partial C} = .004\,C^{.56}$ |
| Defined by ability | $RE = .0000004\,C^{2.5}$ | $\frac{\partial RE}{\partial C} = .000001\,C^{1.5}$ |
| Defined by ability and education | $RE = .0039\,C^{1.49}$ | $\frac{\partial RE}{\partial C} = .0058\,C^{.49}$ |
| **Low-quality personnel** | | |
| Defined by education | $RE = .12\,C$ | $\frac{\partial RE}{\partial C} = .12$ |
| Defined by ability | $RE = .12\,C$ | $\frac{\partial RE}{\partial C} = .12$ |
| Defined by ability and education | $RE = .12\,C$ | $\frac{\partial RE}{\partial C} = .12$ |

## TABLE B-3

## THE MARGINAL RECRUITING COST BY PERSONNEL CATEGORY

| Personnel category | Cost |
|---|---|
| **High-quality personnel** | |
| Defined by education | $\$1{,}439 + 9.1\,C^{.56}$ |
| Defined by ability | $\$1{,}439 + .0023\,C^{1.5}$ |
| Defined by ability and education | $\$1{,}439 + 13.2\,C^{.49}$ |
| **Low-quality personnel** | |
| Defined by education | $\$1{,}439 + \$272 = \$1{,}711$ |
| Defined by ability | $\$1{,}439 + \$272 = \$1{,}711$ |
| Defined by ability and education | $\$1{,}439 + \$272 = \$1{,}711$ |

# APPENDIX C

# TRAINING COSTS

The cost of training an individual who completes boot camp and initial-skill training is calculated from the total cost of training. The cost of training individuals who leave the service is subtracted from the total cost. The total cost of training individuals who complete the training sequence is divided by the number of individuals who finish training to get the cost per success.

The total cost of boot-camp training is derived from the component costs, as shown in table C-1. The component costs are reported as costs per accession and are in FY 1982 dollars. These costs are adjusted to FY 1985 dollars and multiplied by the number of accessions in FY 1985 to get an approximation of the total cost of boot-camp training in FY 1985.

In FY 1985 approximately 3,232 individuals quit boot camp and 32,127 completed boot camp. On average, individuals who leave during this phase of training stay for 48.8 percent of the total course. The cost of training an individual who completes boot camp equals the total cost of boot camp divided by the number of graduates plus the number of departers times the departers' average stay:

$$\text{The cost of completing boot camp} = \frac{\$182,136,684}{32,127 + 3,232(.488)} = \$5,404 \ .$$

Thus, the Marine Corps spends $5,404 to train an individual who completes boot-camp training.

As in the case of boot-camp training costs, the total cost of initial-skill training is also derived from the component costs. As shown in table C-2, the component costs are reported as cost per accession. Two of the component costs are reported in FY 1982 dollars. These costs are inflated to FY 1985 figures. The costs per accession are multiplied by the number of accessions in FY 1985 to get an approximation of the total cost of initial-skill training in that year.

In FY 1985 approximately 612 individuals left during initial-skill training. Approximately 31,515 individuals completed initial-skill training.

On average, individuals who leave during initial-skill training stay for 30.5 percent of the total course. The cost of training an individual who completes initial-skill training equals the total cost of initial-skill training divided by the number of graduates plus the number of departers times the average stay of a departing individual:

$$\frac{\$199,147,451}{31,515 + 612(.305)} = \$6,282 \ .$$

Thus the Marine Corps spends $6,282 to train an individual who completes initial-skill training.

TABLE C-1

TRAINING COSTS IN BOOT CAMP

| | Per accession[a] (FY 82 dollars) | Per accession[b] (FY 85 dollars) | Total[c] (FY 85 dollars) |
|---|---|---|---|
| Instructors' costs | $209 | $ 229.4 | $ 8,111,355 |
| O&M | 47 | 51.6 | 1,824,524 |
| Ammunition | 78 | 85.6 | 3,026,524 |
| Training support | 512 | 562.0 | 19,870,697 |
| Processing out (separations) | 70.2 | 77.1 | 2,726,178 |
| Exam | 169 | 185.5 | 6,559,095 |
| Processing in | 67 | 73.5 | 2,598,887 |
| Clothing | 608 | 667.3 | 23,595,061 |
| Travel to training | – | 686[d] | 24,256,264 |
| Medical and dental coverage | 108.5 | 119.1 | 4,211,257 |
| Basic Pay (E-1 < 4 months of service) | – | 1,543[e] | 54,558,937 |
| BAS | – | 413[e] | 14,603,267 |
| BAQ (for a single E-1) | – | 355[e] | 12,552,445 |
| FICA | – | 103[e] | 3,641,977 |
| Total cost | | | $182,136,684 |

a. Source: [C-1].
b. The FY 1982 figures are inflated to FY 1985 dollars unless otherwise indicated. The Consumer Price Index-Urban rose by 9.76 percent between October 1982 and July 1985.
c. There were 35,359 non-prior-service male accessions in FY 1985.
d. Source: [C-2].
e. Source: [C-3]. Approximately 10.5 percent of the accessions leave during boot camp. The average stay of an individual who leaves is 42.2 days. The average length of boot camp for graduates is 86.47 days. The pay figures equal the average number of days an accession stays times the daily pay rate.

## TABLE C-2

## INITIAL-SKILL TRAINING COSTS

| | Per accession[a] (FY 82 dollars) | Per accession[b] (FY 85 dollars) | Total[c] (FY 85 dollars) |
|---|---|---|---|
| Direct course costs | – | $3,042.0[d] | $ 94,201,939 |
| Processing out (separations) | 13.4 | 14.1 | 498,562 |
| Travel to training | – | 559.4[e] | 19,779,825 |
| Medical and dental coverage | 108.5 | 119.1 | 4,211,257 |
| Basic pay (E-1 < 2 years of service) | – | 1,485.2[f] | 52,515,187 |
| BAS | – | 371.6[f] | 13,139,404 |
| BAQ (for a single E-1) | – | 319.1[f] | 11,283,056 |
| FICA | – | 99.5[f] | 3,518,221 |
| Total | | | $199,147,451 |

a. Source: [C-1].

b. The FY 1982 figures are inflated to FY 1985 dollars unless otherwise indicated. The Consumer Price Index-Urban rose by 9.76 percent between October 1982 and July 1985.

c. There were 35,359 non-prior-service male accessions in FY 1985.

d. Sources: [C-2] and Headquarters, Marine Corps. See appendix D for details.

e. Source: [C-2].

f. Sources: [C-3, C-4]. Approximately 10.5 percent of the accessions never start initial-skill training. Approximately 1.92 percent of the accessions leave during initial-skill training. The average stay of an individual who leaves the service during initial-skill training is 25.47 days. The average length of initial-skill training for graduates is 83.4 days. The pay figures equal the average number of days an accession stays times the daily pay rate.

## REFERENCES

[C-1] Management Consulting and Research, Inc., TR-8201-1, *Improved Marginal Pipeline Costs of Enlisted Personnel*, by Rodney E. McConnell and William P. Hutzler, Dec 1982

[C-2] U.S. Marine Corps, MCO P7000.14, *Marine Corps Cost Factors Manual*, Jun 1985

[C-3] Sharff, Lee E., and Lt.Col. Sol Gordon, USAF (Ret.). *1984 Uniformed Services Almanac.* Washington, D.C.: Uniformed Services Almanac, Inc., 1984

[C-4] Sharff, Lee E., and Lt.Col. Sol Gordon, USAF (Ret.). *1985 Uniformed Services Almanac.* Washington, D.C.: Uniformed Services Almanac, Inc., 1985

# APPENDIX D

## THE AVERAGE COST OF COURSES FOR INITIAL-SKILL TRAINING

The average per-graduate cost of the initial-skill training courses is calculated from raw data. Table D-1 gives the per-graduate cost of the required initial-skill coursework, the duration of the training period, and the number of students in the occupational area for each military occupational specialty (MOS). Using this information, the average cost of initial-skill training courses is calculated by taking a weighted average of the costs per MOS. The average direct course cost per graduate of initial-skill training is $3,042.

## TABLE D-1

## ENTRY-LEVEL MOS TRAINING TRACKS

| MOS | Length of training (in days) | Direct cost of training (in dollars) | Number of graduates (FY 85) |
|---|---|---|---|
| 0121 | 70 | 372 | 157 |
| 0131 | 70 | 151 | 153 |
| 0151 | 70 | 349 | 1023 |
| 0161 | 31 | 3114 | 55 |
| 0231 | 28 | . | 18 |
| 0311 | 38 | 281 | 3720 |
| 0313 | 42 | 281 | 103 |
| 0331 | 38 | 281 | 690 |
| 0341 | 38 | 281 | 718 |
| 0351 | 38 | 281 | 826 |
| 0352 | 38 | 281 | 460 |
| 0411 | 21 | . | 31 |
| 0431 | 21 | . | 105 |
| 0451 | 105 | 17257 | 55 |
| 0481 | 79 | . | 232 |
| 0842 | 49 | 10436 | 26* |
| 0844 | 49 | 4989 | 456* |
| 0847 | 56 | 14432 | 21* |
| 0861 | 44 | 13794 | 126 |
| 1141 | 45 | 1140 | 230 |
| 1161 | 58 | 586 | 95 |
| 1171 | 91 | 1156 | 290 |
| 1181 | 49 | . | 15 |
| 1182 | 105 | . | 15 |
| 1316 | 84 | 3315 | 58 |
| 1341 | 77 | 856 | 396 |
| 1345 | 63 | 6281 | 528 |
| 1371 | 45 | 480 | 698 |
| 1391 | 56 | 6953 | 364 |
| 1411 | 79 | 4386 | 22 |
| 1431 | 78 | 4790 | 23 |
| 1441 | 102 | 7398 | 14 |
| 1442 | 201 | 17108 | 8 |

SOURCE: The data were obtained from U.S. Marine Corps, MCO P7000.14, *Marine Corps Cost Factors Manual*, Jun 1985, and Headquarters, USMC.

** = Estimated number of graduates in FY 1985 (regular Marines only).

* = Estimated number of graduates in FY 1985 (may include reservists)

. = Not available.

TABLE D-1 (Continued)

| MOS | Length of training (in days) | Direct cost of training (in dollars) | Number of graduates (FY 85) |
|---|---|---|---|
| 1521 | 60 | 4143 | 22 |
| 1532 | 98 | 9127 | 3 |
| 1811 | 63 | 10756 | 451 |
| 1833 | 35 | 481 | 542 |
| 2111 | 42 | 8434 | 206 |
| 2112 | . | . | . |
| 2131 | 79 | 17014 | 55 |
| 2142 | 70 | 843 | 15 |
| 2144 | 35 | 16313 | 23 |
| 2145 | 42 | 8738 | 57 |
| 2147 | 49 | . | 85 |
| 2161 | 107 | 26216 | 25 |
| 2171 | 98 | . | 15 |
| 2311 | 42 | . | 254 |
| 2336 | 153 | 9990 | 20 |
| 2513 | 70 | 9483 | 69* |
| 2531 | 63 | 83 | 1602 |
| 2534 | 98 | 1624 | 50 |
| 2535 | 161 | . | 32* |
| 2536 | 147 | . | 0* |
| 2542 | 77 | . | 382 |
| 2621 | 147 | 7794 | 95 |
| 2631 | 161 | 9199 | 10 |
| 2651 | 70 | 6251 | 103 |
| 2670 | 154 | 4278 | 5 |
| 2811 | 196 | 715 | 78 |
| 2813 | 133 | 11186 | 41* |
| 2814 | 322 | 57466 | 10 |
| 2818 | 230 | 1586 | 99* |
| 2819 | 349 | 19191 | 11* |
| 2822 | 315 | . | 3 |
| 2825 | 343 | 26669 | 4 |
| 2827 | 328 | 23288 | 11 |
| 2828 | 161 | . | 4 |
| 2831 | 148 | 7896 | 0 |

SOURCE: The data were obtained from U.S. Marine Corps, MCO P7000.14, *Marine Corps Cost Factors Manual*, Jun 1985, and Headquarters, USMC.

** = Estimated number of graduates in FY 1985 (regular Marines only).

* = Estimated number of graduates in FY 1985 (may include reservists)

. = Not available.

TABLE D-1 (Continued)

| MOS | Length of training (in days) | Direct cost of training (in dollars) | Number of graduates (FY 85) |
|---|---|---|---|
| 2841 | 247 | 2943 | 377 |
| 2871 | 245 | 7233 | 12 |
| 2875 | 175 | 2126 | 59 |
| 2881 | 298 | 14022 | 30 |
| 2882 | 353 | . | 1 |
| 2884 | 172 | 6736 | 13* |
| 2886 | 253 | 16211 | 0 |
| 2887 | 393 | . | 3* |
| 3043 | 49 | 49 | 699 |
| 3052 | 35 | . | 40 |
| 3061 | 35 | 99 | 59 |
| 3072 | 67 | 9520 | 365 |
| 3073 | 108 | 11890 | 30 |
| 3112 | 35 | 7072 | 170 |
| 3311 | 49 | 526 | 202 |
| 3381 | 49 | 587 | 794 |
| 3421 | 63 | 422 | 163 |
| 3431 | 56 | 659 | 13 |
| 3441 | . | . | . |
| 3451 | 63 | 173 | 48 |
| 3513 | 70 | 12543 | 18 |
| 3521 | 115 | 1532 | 758 |
| 3531 | 35 | 373 | 1467* |
| 3533 | 49 | 760 | 390* |
| 4025 | . | . | . |
| 4034 | 28 | 2718 | 71 |
| 4063 | 56 | 1876 | 18 |
| 4313 | 71 | 13804 | 2 |
| 4321 | 72 | 11207 | 19 |
| 4421 | 59 | 258 | 116 |
| 4425 | 186 | 56 | 9 |
| 4611 | 84 | 852 | 10 |
| 4641 | 112 | 1146 | 22 |
| 4653 | 108 | 15215 | 4 |
| 4671 | 108 | 11202 | 9 |

SOURCE: The data were obtained from U.S. Marine Corps, MCO P7000.14, *Marine Corps Cost Factors Manual*, Jun 1985, and Headquarters, USMC.

** = Estimated number of graduates in FY 1985 (regular Marines only).

* = Estimated number of graduates in FY 1985 (may include reservists)

. = Not available.

TABLE D-1 (Continued)

| MOS | Length of training (in days) | Direct cost of training (in dollars) | Number of graduates (FY 85) |
|---|---|---|---|
| 5500 | 168 | 4607 | 54 |
| 5711 | 35 | 5363 | 280* |
| 5811 | 56 | 3961 | 529* |
| 5812 | 104 | 8749 | 76* |
| 5831 | 39 | 3482 | 142* |
| 5921 | 203 | 11873 | 3** |
| 5922 | 175 | 53926 | 13** |
| 5923 | 168 | 65742 | 14** |
| 5929 | 224 | 59413 | 1** |
| 5937 | 229 | 3818 | 67** |
| 5938 | 443 | 29888 | 19** |
| 5943 | 217 | 5503 | 1** |
| 5944 | 252 | . | 33** |
| 5945 | 280 | . | 24** |
| 5952 | 290 | 23236 | 28 |
| 5953 | 415 | 28529 | 37 |
| 5962 | 212 | 12671 | 16** |
| 5963 | 224 | 5316 | 25** |
| 5964 | 266 | 17378 | 24** |
| 5982 | 283 | 15983 | 9** |
| 6012 | 107 | 5688 | 109 |
| 6013 | 110 | 5688 | 66 |
| 6014 | 120 | 5688 | 103 |
| 6015 | 138 | 5688 | 103 |
| 6016 | 147 | 8210 | 51 |
| 6017 | 91 | 5688 | 73 |
| 6018 | 122 | 8210 | 13 |
| 6022 | 117 | 5688 | 22 |
| 6023 | 139 | 8210 | 3 |
| 6024 | 117 | 5688 | 21 |
| 6025 | 165 | 5688 | 13 |
| 6026 | 112 | 5688 | 25 |
| 6027 | 142 | 5688 | 12 |
| 6046 | 54 | 3114 | 135** |
| 6047 | 44 | 3843 | 53** |

SOURCE: The data were obtained from U.S. Marine Corps, MCO P7000.14, *Marine Corps Cost Factors Manual*, Jun 1985, and Headquarters, USMC.

** = Estimated number of graduates in FY 1985 (regular Marines only).

* = Estimated number of graduates in FY 1985 (may include reservists)

. = Not available.

TABLE D-1 (Continued)

| MOS | Length of training (in days) | Direct cost of training (in dollars) | Number of graduates (FY 85) |
|---|---|---|---|
| 6052 | 97 | 2119 | 37 |
| 6053 | 127 | 2119 | 39 |
| 6054 | 143 | 2119 | 55 |
| 6055 | 138 | 2119 | 25 |
| 6056 | 118 | 2119 | 19 |
| 6057 | 146 | 2119 | 21 |
| 6058 | 126 | 2119 | 2 |
| 6060 | 75 | 5729 | 106** |
| 6072 | 266 | 5114 | 132 |
| 6075 | 98 | . | 49** |
| 6076 | 302 | 5114 | 78 |
| 6077 | 238 | 4030 | 96 |
| 6078 | 189 | 4030 | 65 |
| 6082 | 110 | 3152 | 25 |
| 6083 | 194 | 5114 | 24** |
| 6084 | 208 | 5114 | 24** |
| 6085 | 213 | 5114 | 18 |
| 6086 | 172 | 5114 | 13 |
| 6087 | 185 | 5114 | 17 |
| 6088 | 170 | 5114 | 11 |
| 6092 | 102 | . | 39 |
| 6093 | 130 | . | 32 |
| 6094 | 153 | . | 50 |
| 6095 | 120 | . | 32 |
| 6096 | 105 | . | 23 |
| 6097 | 142 | . | 25 |
| 6098 | 129 | . | 5 |
| 6112 | 95 | 4506 | 103 |
| 6113 | 100 | 4506 | 65 |
| 6114 | 95 | 4506 | 132 |
| 6115 | 142 | 4506 | 75 |
| 6122 | 116 | 2328 | 24 |
| 6123 | 122 | 2328 | 63 |
| 6124 | 94 | 2328 | 0 |
| 6125 | 100 | 2328 | 42 |

SOURCE: The data were obtained from U.S. Marine Corps, MCO P7000.14, *Marine Corps Cost Factors Manual*, Jun 1985, and Headquarters, USMC.

** = Estimated number of graduates in FY 1985 (regular Marines only).

* = Estimated number of graduates in FY 1985 (may include reservists)

. = Not available.

TABLE D-1 (Continued)

| MOS | Length of training (in days) | Direct cost of training (in dollars) | Number of graduates (FY 85) |
|---|---|---|---|
| 6132 | 89 | 4506 | 47 |
| 6142 | 131 | . | 28** |
| 6143 | 148 | . | 62** |
| 6144 | 109 | . | 44** |
| 6152 | 104 | 2119 | 38 |
| 6153 | 123 | 2119 | 32 |
| 6154 | 131 | 2119 | 49 |
| 6155 | 129 | 2119 | 49 |
| 6312 | 234 | 8052 | 49 |
| 6313 | 264 | 8052 | 53 |
| 6314 | 273 | 8052 | 25 |
| 6315 | 257 | 8052 | 53 |
| 6316 | 256 | 8052 | 26 |
| 6317 | 251 | 8052 | 29 |
| 6322 | 237 | 8052 | 25 |
| 6323 | 245 | 8052 | 37 |
| 6324 | 243 | 8052 | 59 |
| 6332 | 231 | 10485 | 39 |
| 6333 | 223 | 10485 | 56 |
| 6334 | 301 | 10485 | 37 |
| 6335 | 252 | 10485 | 35 |
| 6336 | 221 | 10485 | 30 |
| 6337 | 282 | 10485 | 34 |
| 6342 | 247 | 10485 | 47 |
| 6343 | 253 | 10485 | 24 |
| 6344 | 252 | 10485 | 11 |
| 6345 | 285 | 10485 | 20 |
| 6352 | 224 | 8052 | 8 |
| 6353 | 291 | 8052 | 31 |
| 6354 | 302 | 8052 | 42 |
| 6355 | 250 | 8052 | 31 |
| 6357 | 275 | 8052 | 34 |
| 6352 | 251 | 8052 | 0 |
| 6362 | 276 | 8052 | 1 |
| 6363 | 226 | 8052 | 12 |

SOURCE: The data were obtained from U.S. Marine Corps, MCO P7000.14, *Marine Corps Cost Factors Manual*, Jun 1985, and Headquarters, USMC.

** = Estimated number of graduates in FY 1985 (regular Marines only).

* = Estimated number of graduates in FY 1985 (may include reservists)

. = Not available.

TABLE D-1 (Continued)

| MOS | Length of training (in days) | Direct cost of training (in dollars) | Number of graduates (FY 85) |
|---|---|---|---|
| 6364 | 247 | 8052 | 12 |
| 6365 | 234 | 0 | 17 |
| 6367 | 441 | 13284 | 22 |
| 6372 | 212 | 10485 | 21 |
| 6374 | 152 | . | 2 |
| 6386 | 276 | 8052 | 35 |
| 6412 | 263 | 8052 | 81 |
| 6413 | 266 | 8052 | 50 |
| 6414 | 249 | 8052 | 100 |
| 6415 | 266 | 8052 | 93 |
| 6416 | 245 | 8052 | 19 |
| 6432 | 284 | 10485 | 60 |
| 6433 | 236 | 10485 | 70 |
| 6434 | 225 | 10485 | 32 |
| 6435 | 220 | 10485 | 15 |
| 6442 | 361 | 13284 | 9 |
| 6443 | 371 | 13284 | 15 |
| 6444 | 382 | 13284 | 15 |
| 6445 | 368 | 13284 | 19 |
| 6446 | 354 | 13284 | 16 |
| 6452 | 345 | 13284 | 6 |
| 6453 | 305 | 13284 | 10 |
| 6454 | 350 | 13284 | 8 |
| 6455 | 306 | 13284 | 5 |
| 6462 | 367 | 13284 | 1 |
| 6463 | 342 | 13284 | 0 |
| 6464 | 312 | 10851 | 15 |
| 6465 | 309 | 13284 | 1 |
| 6472 | 266 | 13284 | 32 |
| 6473 | 335 | 13284 | 4 |
| 6474 | 324 | 13284 | 10 |
| 6475 | 329 | 13284 | 10 |
| 6476 | 315 | 13284 | 13 |
| 6477 | 424 | 13284 | 32 |
| 6482 | 333 | 13284 | 106 |

SOURCE: The data were obtained from U.S. Marine Corps, MCO P7000.14, *Marine Corps Cost Factors Manual*, Jun 1985, and Headquarters, USMC.

** = Estimated number of graduates in FY 1985 (regular Marines only).

* = Estimated number of graduates in FY 1985 (may include reservists)

. = Not available.

TABLE D-1 (Continued)

| MOS | Length of training (in days) | Direct cost of training (in dollars) | Number of graduates (FY 85) |
|---|---|---|---|
| 6492 | 287 | . | 38** |
| 6521 | 102 | 2527 | 127 |
| 6531 | 138 | 2527 | 36 |
| 6532 | 122 | 2527 | 29 |
| 6534 | 147 | 2527 | 39 |
| 6535 | 150 | 2527 | 45 |
| 6536 | 171 | 2527 | 52 |
| 6537 | 153 | 2527 | 42 |
| 6541 | 182 | 2527 | 86 |
| 6542 | 147 | 2527 | 21 |
| 6821 | 74 | 10424 | 7** |
| 6822 | 116 | 16579 | 5** |
| 7011 | 40 | 9241 | 75 |
| 7041 | 59 | 2697 | 167** |
| 7051 | 33 | . | 78 |
| 7212 | 42 | 15689 | 103 |
| 7222 | 66 | . | 86 |
| 7234 | 42 | 2739 | 28 |
| 7242 | 98 | 2280 | 28 |
| 7312 | 106 | 0 | 137 |
| 7371 | 168 | 83987 | 9 |
| 7382 | 91 | . | 16** |

SOURCE: The data were obtained from U.S. Marine Corps, MCO P7000.14, *Marine Corps Cost Factors Manual*, Jun 1985, and Headquarters, USMC.

** = Estimated number of graduates in FY 1985 (regular Marines only).

* = Estimated number of graduates in FY 1985 (may include reservists)

. = Not available.

## TABLE E-1

## REGRESSION ANALYSIS DATA

| All | HSG | RE | P | U | Cat. I-IIIa | HSG, NHSG Cat. I-IIIa |
|---|---|---|---|---|---|---|
| 105 | 57 | 59 | 2236 | 8.1 | 48 | 76 |
| 106 | 78 | 58 | 5182 | 6.1 | 62 | 90 |
| 46 | 38 | 30 | 3153 | 8.1 | 36 | 44 |
| 40 | 31 | 24 | 1462 | 8.1 | 28 | 37 |
| 39 | 25 | 27 | 1466 | 8.1 | 30 | 36 |
| 64 | 49 | 35 | 1552 | 8.1 | 40 | 58 |
| 52 | 42 | 24 | 1242 | 7.1 | 37 | 48 |
| 45 | 27 | 34 | 1647 | 8.1 | 33 | 41 |
| 29 | 22 | 25 | 1020 | 8.1 | 14 | 26 |
| 48 | 38 | 26 | 956 | 6.1 | 23 | 40 |
| 42 | 36 | 26 | 1666 | 7.9 | 28 | 40 |
| 85 | 70 | 45 | 4251 | 6.9 | 49 | 81 |
| 60 | 47 | 29 | 1323 | 6.9 | 37 | 57 |
| 77 | 66 | 36 | 5306 | 6.9 | 52 | 69 |
| 35 | 30 | 11 | 859 | 6.9 | 13 | 32 |
| 62 | 50 | 34 | 4031 | 6.9 | 24 | 57 |
| 50 | 42 | 26 | 3013 | 6.9 | 36 | 47 |
| 52 | 35 | 25 | 2836 | 6.9 | 32 | 44 |
| 77 | 57 | 33 | 3828 | 8.6 | 42 | 68 |
| 88 | 71 | 40 | 2895 | 8.6 | 35 | 79 |
| 68 | 54 | 33 | 2548 | 8.6 | 31 | 59 |
| 65 | 44 | 34 | 2248 | 8.6 | 34 | 52 |
| 129 | 97 | 66 | 8610 | 4.7 | 81 | 112 |
| 102 | 78 | 51 | 5222 | 6.3 | 71 | 96 |
| 28 | 23 | 49 | 2234 | 6.3 | 18 | 26 |
| 281 | 236 | 96 | 6549 | 6.3 | 89 | 255 |
| 88 | 69 | 32 | 2393 | 4.7 | 32 | 76 |
| 109 | 83 | 36 | 2438 | 5.5 | 42 | 92 |
| 113 | 89 | 42 | 2851 | 5.5 | 61 | 100 |
| 125 | 105 | 56 | 7098 | 4.7 | 80 | 121 |
| 243 | 173 | 97 | 4193 | 8.3 | 68 | 191 |
| 28 | 25 | 15 | 1470 | 7.4 | 9 | 27 |
| 115 | 82 | 47 | 2794 | 4.7 | 36 | 89 |
| 48 | 34 | 12 | 1888 | 4.7 | 32 | 41 |
| 66 | 48 | 27 | 2085 | 4.7 | 29 | 56 |
| 42 | 34 | 24 | 1595 | 4.7 | 22 | 35 |
| 121 | 96 | 50 | 1607 | 5.3 | 57 | 107 |
| 41 | 27 | 19 | 2348 | 5.3 | 18 | 32 |

SOURCE: The data were collected from a variety of sources, as explained in Center for Naval Analyses Study 1117, *The Supply of Marine Corps Recruits—A Micro Approach*, by William E. Cralley, Unclassified, Sep 1979.

TABLE E-1 (Continued)

| All | HSG | RE | P | U | Cat. I-IIIa | HSG, NHSG Cat. I-IIIa |
|---|---|---|---|---|---|---|
| 18 | 16 | 24 | 2833 | 5.3 | 14 | 17 |
| 54 | 44 | 22 | 2665 | 5.3 | 33 | 48 |
| 71 | 50 | 36 | 3237 | 6.3 | 36 | 62 |
| 35 | 23 | 24 | 1275 | 4.7 | 19 | 26 |
| 41 | 32 | 23 | 1864 | 4.7 | 17 | 36 |
| 85 | 67 | 44 | 2616 | 4.7 | 37 | 76 |
| 53 | 43 | 24 | 2006 | 5.3 | 29 | 44 |
| 105 | 70 | 36 | 2491 | 4.7 | 36 | 82 |
| 83 | 60 | 28 | 2967 | 4.7 | 44 | 72 |
| 51 | 41 | 24 | 2332 | 4.7 | 36 | 45 |
| 44 | 32 | 30 | 1671 | 5.3 | 22 | 35 |
| 31 | 25 | 12 | 970 | 4.7 | 20 | 28 |
| 42 | 34 | 19 | 1788 | 4.7 | 30 | 38 |
| 44 | 25 | 16 | 2024 | 6.2 | 28 | 37 |
| 75 | 57 | 42 | 2374 | 6.3 | 45 | 66 |
| 56 | 39 | 27 | 1946 | 7.1 | 32 | 49 |
| 26 | 22 | 12 | 1388 | 7.1 | 24 | 24 |
| 26 | 14 | 14 | 1408 | 7.1 | 13 | 19 |
| 35 | 10 | 12 | 1452 | 6.2 | 21 | 25 |
| 40 | 32 | 21 | 983 | 5.9 | 10 | 35 |
| 19 | 18 | 14 | 722 | 5.9 | 10 | 19 |
| 38 | 28 | 14 | 916 | 6.3 | 19 | 31 |
| 66 | 50 | 44 | 2927 | 5.9 | 28 | 58 |
| 32 | 22 | 31 | 1786 | 5.9 | 22 | 30 |
| 41 | 22 | 21 | 1985 | 6.2 | 24 | 34 |
| 27 | 23 | 27 | 2043 | 7.1 | 25 | 35 |
| 19 | 10 | 19 | 2009 | 7.1 | 11 | 15 |
| 26 | 16 | 12 | 1208 | 7.1 | 12 | 22 |
| 41 | 23 | 27 | 1687 | 7.1 | 21 | 29 |
| 30 | 21 | 12 | 1467 | 7.1 | 15 | 26 |
| 59 | 33 | 30 | 2900 | 6.3 | 37 | 50 |
| 52 | 28 | 26 | 1607 | 6.3 | 28 | 39 |
| 29 | 19 | 12 | 923 | 6.3 | 16 | 26 |
| 20 | 18 | 12 | 678 | 6.3 | 15 | 19 |
| 56 | 28 | 21 | 1527 | 6.2 | 33 | 42 |
| 29 | 15 | 19 | 1561 | 6.2 | 13 | 19 |
| 25 | 17 | 18 | 1469 | 6.2 | 12 | 22 |
| 62 | 42 | 22 | 1837 | 6.2 | 32 | 53 |
| 56 | 26 | 39 | 2552 | 6.2 | 33 | 45 |
| 56 | 39 | 20 | 2232 | 7.1 | 33 | 53 |

SOURCE: The data were collected from a variety of sources, as explained in Center for Naval Analyses Study 1117, *The Supply of Marine Corps Recruits—A Micro Approach*, by William E. Cralley, Unclassified, Sep 1979.

TABLE E-1 (Continued)

| All | HSG | RE | P | U | Cat. I-IIIa | HSG, NHSG Cat. I-IIIa |
|---|---|---|---|---|---|---|
| 23 | 17 | 12 | 1010 | 7.1 | 9 | 20 |
| 8 | 6 | 11 | 1013 | 5.9 | 4 | 7 |
| 36 | 28 | 31 | 2192 | 5.9 | 14 | 31 |
| 45 | 31 | 40 | 4432 | 5.9 | 23 | 38 |
| 21 | 13 | 22 | 1408 | 5.9 | 12 | 17 |
| 73 | 49 | 48 | 3161 | 5.9 | 37 | 58 |
| 24 | 10 | 38 | 3746 | 5.9 | 20 | 21 |
| 16 | 10 | 17 | 928 | 5.9 | 5 | 13 |
| 20 | 13 | 23 | 2120 | 5.0 | 7 | 14 |
| 39 | 33 | 28 | 4346 | 4.3 | 21 | 38 |
| 40 | 37 | 21 | 2074 | 4.3 | 9 | 39 |
| 38 | 27 | 24 | 2365 | 5.0 | 17 | 33 |
| 46 | 33 | 23 | 1979 | 5.0 | 28 | 38 |
| 57 | 47 | 12 | 1039 | 4.3 | 3 | 48 |
| 64 | 49 | 38 | 3287 | 6.5 | 17 | 57 |
| 78 | 59 | 38 | 2844 | 6.5 | 15 | 64 |
| 87 | 57 | 39 | 2791 | 6.5 | 22 | 65 |
| 22 | 16 | 12 | 680 | 5.9 | 5 | 18 |
| 28 | 18 | 17 | 1640 | 5.9 | 9 | 21 |
| 48 | 37 | 48 | 2852 | 4.8 | 17 | 44 |
| 53 | 44 | 41 | 2001 | 6.5 | 21 | 47 |
| 18 | 15 | 11 | 1209 | 7.8 | 9 | 17 |
| 22 | 18 | 23 | 1306 | 7.8 | 9 | 20 |
| 7 | 7 | 11 | 814 | 6.5 | 4 | 7 |
| 15 | 10 | 11 | 847 | 6.5 | 4 | 12 |
| 53 | 44 | 38 | 1753 | 4.1 | 17 | 46 |
| 46 | 26 | 32 | 2716 | 4.1 | 21 | 35 |
| 39 | 26 | 23 | 1735 | 4.1 | 23 | 32 |
| 73 | 51 | 35 | 2781 | 4.1 | 25 | 61 |
| 40 | 22 | 27 | 1852 | 4.1 | 20 | 29 |
| 56 | 33 | 57 | 3276 | 4.1 | 25 | 41 |
| 19 | 12 | 28 | 1628 | 4.1 | 10 | 16 |
| 32 | 23 | 16 | 2716 | 4.1 | 20 | 28 |
| 15 | 8 | 15 | 979 | 4.1 | 4 | 10 |
| 20 | 13 | 12 | 565 | 4.1 | 12 | 17 |
| 9 | 3 | 9 | 597 | 4.1 | 4 | 5 |
| 53 | 34 | 24 | 1495 | 4.1 | 25 | 42 |
| 30 | 24 | 20 | 1624 | 6.5 | 11 | 28 |
| 31 | 14 | 23 | 1176 | 4.8 | 7 | 17 |
| 28 | 18 | 18 | 1628 | 4.8 | 8 | 19 |

SOURCE: The data were collected from a variety of sources, as explained in Center for Naval Analyses Study 1117, *The Supply of Marine Corps Recruits – A Micro Approach*, by William E. Cralley, Unclassified, Sep 1979.

TABLE E-1 (Continued)

| All | HSG | RE | P | U | Cat. I-IIIa | HSG, NHSG Cat. I-IIIa |
|---|---|---|---|---|---|---|
| 25 | 14 | 24 | 1325 | 4.1 | 14 | 18 |
| 16 | 9 | 12 | 979 | 3.6 | 3 | 9 |
| 96 | 61 | 64 | 4201 | 4.6 | 52 | 81 |
| 72 | 49 | 32 | 1054 | 4.6 | 36 | 60 |
| 80 | 44 | 58 | 3697 | 4.6 | 48 | 61 |
| 86 | 48 | 46 | 2561 | 4.6 | 47 | 70 |
| 34 | 23 | 18 | 1025 | 4.6 | 27 | 31 |
| 26 | 19 | 23 | 1553 | 5.7 | 18 | 24 |
| 13 | 9 | 16 | 932 | 5.7 | 10 | 12 |
| 12 | 5 | 12 | 1172 | 5.7 | 7 | 10 |
| 47 | 32 | 35 | 2513 | 4.4 | 31 | 40 |
| 29 | 15 | 19 | 1593 | 4.4 | 15 | 25 |
| 15 | 13 | 12 | 699 | 4.4 | 7 | 14 |
| 22 | 16 | 33 | 2123 | 5.7 | 7 | 17 |
| 15 | 10 | 12 | 1075 | 3.6 | 12 | 14 |
| 26 | 18 | 23 | 1421 | 3.6 | 22 | 25 |
| 65 | 35 | 44 | 3835 | 3.6 | 42 | 53 |
| 11 | 9 | 12 | 978 | 3.6 | 9 | 10 |
| 22 | 16 | 19 | 1434 | 3.7 | 16 | 18 |
| 48 | 33 | 52 | 3641 | 3.8 | 28 | 40 |
| 52 | 35 | 44 | 6233 | 5.5 | 39 | 46 |
| 3 | 3 | 10 | 1707 | 5.5 | 0 | 3 |
| 23 | 20 | 20 | 2120 | 5.5 | 16 | 23 |
| 39 | 28 | 41 | 2770 | 5.5 | 26 | 36 |
| 35 | 24 | 10 | 1195 | 5.5 | 20 | 28 |
| 47 | 27 | 34 | 4615 | 5.5 | 36 | 41 |
| 30 | 20 | 22 | 1982 | 5.5 | 21 | 27 |
| 70 | 38 | 45 | 3170 | 5.4 | 32 | 53 |
| 5 | 4 | 14 | 837 | 5.4 | 3 | 5 |
| 19 | 13 | 27 | 1690 | 5.5 | 16 | 18 |
| 18 | 12 | 20 | 1536 | 5.5 | 13 | 17 |
| 103 | 56 | 34 | 1026 | 5.5 | 52 | 85 |
| 60 | 50 | 24 | 2454 | 5.5 | 25 | 56 |
| 34 | 20 | 28 | 1818 | 5.5 | 19 | 26 |
| 112 | 62 | 42 | 2766 | 5.5 | 46 | 93 |
| 24 | 14 | 18 | 1104 | 5.5 | 17 | 20 |
| 33 | 18 | 26 | 1588 | 5.5 | 15 | 25 |
| 34 | 20 | 23 | 3678 | 5.5 | 21 | 27 |
| 55 | 47 | 27 | 989 | 5.5 | 16 | 51 |
| 85 | 56 | 27 | 1557 | 5.5 | 34 | 72 |

SOURCE: The data were collected from a variety of sources, as explained in Center for Naval Analyses Study 1117, *The Supply of Marine Corps Recruits—A Micro Approach*, by William E. Cralley, Unclassified, Sep 1979.

TABLE E-1 (Continued)

| All | HSG | RE | P | U | Cat. I-IIIa | HSG, NHSG Cat. I-IIIa |
|---|---|---|---|---|---|---|
| 129 | 94 | 62 | 4022 | 5.5 | 65 | 116 |
| 157 | 96 | 50 | 1166 | 5.5 | 48 | 115 |
| 22 | 17 | 19 | 1938 | 5.5 | 10 | 18 |
| 119 | 80 | 44 | 1191 | 5.6 | 57 | 100 |
| 36 | 26 | 24 | 1587 | 5.5 | 11 | 27 |
| 78 | 56 | 37 | 2376 | 5.6 | 43 | 69 |
| 9 | 5 | 12 | 1465 | 5.6 | 9 | 9 |
| 32 | 21 | 22 | 1403 | 5.5 | 19 | 28 |
| 67 | 43 | 39 | 2515 | 5.5 | 34 | 52 |
| 30 | 24 | 15 | 1297 | 4.9 | 19 | 28 |
| 33 | 22 | 12 | 1147 | 5.5 | 20 | 29 |
| 15 | 14 | 12 | 832 | 6.0 | 9 | 15 |
| 55 | 36 | 33 | 1988 | 5.4 | 19 | 40 |
| 34 | 24 | 24 | 1364 | 5.7 | 12 | 27 |
| 42 | 32 | 40 | 1871 | 5.0 | 32 | 39 |
| 30 | 19 | 28 | 3094 | 5.0 | 19 | 24 |
| 15 | 12 | 13 | 719 | 6.0 | 11 | 14 |
| 69 | 51 | 38 | 2412 | 8.2 | 37 | 59 |
| 48 | 32 | 34 | 2443 | 5.7 | 29 | 40 |
| 12 | 9 | 14 | 722 | 6.0 | 5 | 10 |
| 57 | 43 | 34 | 1997 | 6.7 | 33 | 49 |
| 30 | 14 | 18 | 1537 | 6.0 | 20 | 23 |
| 39 | 28 | 21 | 1246 | 5.4 | 17 | 32 |
| 37 | 22 | 16 | 1528 | 6.5 | 24 | 32 |
| 22 | 13 | 24 | 1549 | 6.4 | 14 | 17 |
| 70 | 48 | 36 | 2405 | 6.4 | 44 | 62 |
| 15 | 11 | 12 | 829 | 5.4 | 10 | 13 |
| 54 | 36 | 23 | 1722 | 7.4 | 31 | 45 |
| 47 | 32 | 24 | 2151 | 7.4 | 30 | 40 |
| 44 | 28 | 16 | 1011 | 5.9 | 23 | 37 |
| 20 | 16 | 20 | 765 | 6.3 | 15 | 19 |
| 17 | 9 | 15 | 1247 | 6.9 | 12 | 13 |
| 75 | 50 | 22 | 1789 | 6.9 | 33 | 60 |
| 44 | 20 | 21 | 2254 | 7.4 | 16 | 28 |
| 65 | 34 | 35 | 1907 | 7.6 | 34 | 46 |
| 42 | 24 | 32 | 1959 | 7.6 | 26 | 32 |
| 21 | 17 | 19 | 3350 | 7.6 | 16 | 18 |
| 24 | 16 | 16 | 1461 | 7.4 | 12 | 21 |
| 76 | 44 | 35 | 4104 | 7.6 | 38 | 60 |
| 29 | 22 | 12 | 1191 | 7.6 | 16 | 24 |

SOURCE: The data were collected from a variety of sources, as explained in Center for Naval Analyses Study 1117, *The Supply of Marine Corps Recruits – A Micro Approach*, by William E. Cralley, Unclassified, Sep 1979.

TABLE E-1 (Continued)

| All | HSG | RE | P | U | Cat. I-IIIa | HSG, NHSG Cat. I-IIIa |
|---|---|---|---|---|---|---|
| 47 | 36 | 57 | 2277 | 8.8 | 30 | 43 |
| 13 | 10 | 6 | 636 | 8.8 | 6 | 11 |
| 36 | 25 | 15 | 1761 | 7.6 | 22 | 32 |
| 87 | 68 | 50 | 4011 | 7.6 | 31 | 72 |
| 43 | 25 | 24 | 2137 | 7.6 | 15 | 35 |
| 69 | 45 | 59 | 3415 | 7.6 | 24 | 53 |
| 80 | 54 | 42 | 2678 | 8.8 | 36 | 68 |
| 7 | 6 | 8 | 983 | 8.8 | 5 | 7 |
| 20 | 14 | 24 | 1879 | 7.6 | 14 | 17 |
| 123 | 86 | 56 | 2226 | 7.6 | 34 | 95 |
| 47 | 34 | 34 | 2292 | 7.6 | 25 | 38 |
| 63 | 45 | 31 | 2132 | 7.6 | 32 | 57 |
| 19 | 12 | 20 | 1456 | 7.6 | 8 | 15 |
| 33 | 23 | 25 | 2728 | 7.6 | 18 | 27 |
| 40 | 27 | 36 | 3040 | 7.6 | 21 | 34 |
| 43 | 29 | 31 | 1843 | 7.6 | 19 | 36 |
| 38 | 24 | 16 | 1620 | 7.6 | 15 | 30 |
| 58 | 40 | 36 | 2284 | 7.4 | 18 | 44 |
| 17 | 6 | 53 | 2979 | 7.4 | 10 | 11 |
| 56 | 33 | 56 | 3227 | 7.2 | 26 | 45 |
| 105 | 67 | 88 | 7258 | 4.9 | 60 | 87 |
| 40 | 29 | 33 | 1207 | 7.4 | 17 | 35 |
| 96 | 50 | 51 | 2654 | 7.4 | 48 | 75 |
| 30 | 19 | 38 | 2224 | 7.4 | 17 | 24 |
| 29 | 20 | 48 | 3143 | 4.9 | 78 | 25 |
| 5 | 3 | 31 | 2915 | 4.9 | 5 | 5 |
| 45 | 26 | 28 | 1850 | 5.1 | 30 | 38 |
| 22 | 10 | 12 | 683 | 6.7 | 13 | 17 |
| 86 | 40 | 49 | 4052 | 3.1 | 58 | 69 |
| 27 | 21 | 2 | 594 | 6.7 | 15 | 23 |
| 81 | 48 | 54 | 2811 | 5.1 | 56 | 66 |
| 44 | 26 | 59 | 2269 | 6.7 | 33 | 37 |
| 19 | 7 | 12 | 900 | 5.1 | 10 | 14 |
| 47 | 26 | 23 | 1615 | 6.7 | 31 | 37 |
| 37 | 23 | 21 | 1516 | 5.1 | 24 | 31 |
| 20 | 13 | 4 | 1338 | 3.1 | 13 | 16 |
| 8 | 4 | 5 | 737 | 5.1 | 4 | 6 |
| 47 | 19 | 37 | 3287 | 5.7 | 29 | 33 |
| 36 | 23 | 22 | 1307 | 5.1 | 27 | 34 |
| 14 | 7 | 10 | 716 | 5.1 | 7 | 11 |

SOURCE: The data were collected from a variety of sources, as explained in Center for Naval Analyses Study 1117, *The Supply of Marine Corps Recruits – A Micro Approach*, by William E. Cralley, Unclassified, Sep 1979.